

All Public Work Projects are required to use the Louisiana Uniform Public Work Bid Form

All prices must be held firm unless an escalation provision is requested in this bid. Jefferson Parish will allow one escalation during the term of the contract, which may not exceed the U.S. Bureau of Labor Statistics National Index for all Urban Consumers, unadjusted 12 month figure. The most recently published figure issued at the time an adjustment is requested will be used. A request must be made in writing by the vendor, and the escalation will only be applied to purchases made after the request is made.

Are you requesting an escalation provision?

YES _____ NO ✓

MAXIMUM ESCALATION PERCENTAGE REQUESTED _____%

INITIAL BID PRICES WILL REMAIN FIRM THROUGH THE DATE OF 12/31/2017.

For the purposes of comparison of bids when an escalation provision is requested, Jefferson Parish will apply the maximum escalation percentage quoted by the bidder to the period to which it is applied in the bid. The initial price and the escalation will be used to calculate the total bid price. It will be assumed, for comparison of prices only, that an equal amount of material or labor is purchased each month throughout the entire contract.

DELIVERY: FOB JEFFERSON PARISH

INDICATE DELIVERY DATE ON EQUIPMENT AND SUPPLIES

12-18 weeks ARO

LOUISIANA CONTRACTOR'S LICENSE NO.: (if applicable)

NA**THIS SECTION MUST BE COMPLETED BY BIDDER:**

FIRM NAME: Better Pumps & Solutions, LLC
ADDRESS: 1285 Bayou Paul Lane
CITY, STATE: St. Gabriel, La. ZIP: 70776
TELEPHONE: (225) 319-7260 FAX: (225) 319-7264
EMAIL ADDRESS: bguidry@betterpumps.com

In the event that addenda are issued with this bid, bidders MUST acknowledge all addenda on the bid form. Bidder must acknowledge receipt of an addendum on the bid form as indicated. Failure to acknowledge any addendum on the bid form will result in bid rejection.

Acknowledge Receipt of Addenda: NUMBER: 1
NUMBER: _____
NUMBER: _____
NUMBER: _____

TOTAL PRICE OF ALL BID ITEMS: \$ 1,379,700.00

AUTHORIZED SIGNATURE: Billy H. Guidry
TITLE: President

Billy H. Guidry
Printed Name

SIGNING INDICATES YOU HAVE READ AND COMPLY WITH THE INSTRUCTIONS AND CONDITIONS.

NOTE: All bids should be returned with the BID NUMBER and BID OPENING DATE indicated on the outside of the envelope submitted to the Purchasing Department.

INVITATION TO BID FROM JEFFERSON PARISH - continued

BID NO.: 50-00118484

SEALED BID

ITEM NUMBER	QUANTITY	U/M	DESCRIPTION OF ARTICLES	UNIT PRICE QUOTED	TOTALS
1	1.00	EA	PURCHASE OF ELECTRIC DIESEL PUMP UNITS AT PONTIFF PLAYGROUND FOR THE JEFFERSON PARISH DRAINAGE DEPARTMENT		
			0010 Electric Diesel Drive Pump Unit 40 cfs@13.68TDH HAC324 or pre-approved equal 150 HP 40 cfs TDH 13.68 freight ioncluded Name of station: Northwest no.13	\$144,442.00	\$144,442.00
2	1.00	EA	0020 Electric Diesel Drive Pump Unit 20cfs@10.88TDH HAC320 or pre-approved equal 60 HP 20 cfs DH 10.88 Name of Station: Northline no.3 freight included	\$117,783.00	\$117,783.00
3	1.00	EA	0030 Electric Diesel Pump Unit 32cfs@15.81TDH HAC324 or pre approved equal HP 125 32cfsa TDH 15.81 freight included Name of station: Magnolia no.7	\$144,442.00	\$144,442.00
4	1.00	EA	0040 Electric Diesel Drive Pump Unit 20cfs@12.59TDH HAC320 or pre-approved equal 60 HP 20 cfs TDH 12.59 freight included Name of station: North East no.4 Alternate no. 1	\$117,783.00	\$117,783.00
5	1.00	EA	0050 Electric Diesel Drive Pump Unit 40cfs@15.78TDH HAC324 or pre-approved equal 150 HP 40cfs TDH 15.78 freight included Name of Station Gilmore no. 14 Alternate no. 2	\$144,442.00	\$144,442.00
6	1.00	EA	0060 Electric Diesel Drive Pump Unit 32cfs@15.81TDH HAC324 or pre-approved equal 125 HP 32 cfs TDH 15.81 freight included Name of Station: Magnolia no.3 Alternate no. 3	\$144,442.00	\$144,442.00
7	1.00	EA	0070 Electric Diesel Drive Pump Unit 26cfs@6.87TDH	\$116,558.00	\$116,558.00

INVITATION TO BID FROM JEFFERSON PARISH - continued

BID NO.: 50-00118484

SEALED BID

ITEM NUMBER	QUANTITY	U/M	DESCRIPTION OF ARTICLES	UNIT PRICE QUOTED	TOTALS
8	1.00	EA	50 HP 26 cfs TDH 6.87 freight included HAC320 or pre-approved equal Name of Station: Nassau no. 6 Alternate no. 4 0080 Electrid Diesel Drive Pump Unit 20cfs@16.77TDH HAC320 100 HP 20 cfs TDH 16.77 freight included Name of Station: Southwest no. 1 Alternate no. 5	\$137,147.00 \$137,147.00	\$137,147.00 \$137,147.00
9	1.00	EA	0090 Electric Diesel Drive Pump Unit 32cfs@11.32TDH HAC324 or pre-approved HP 100 32 CFS TDH 11.32 freight included Name of Station: Earhart no. 8 Alternate no. 6	\$137,147.00 \$137,147.00	\$137,147.00 \$137,147.00
10	1.00	EA	0100 Electric Diesel Drive Pump Unit 32cfs@17.55TDH HAC324 or pre-approved equal HP 150 CFS 32 TDH 17.55 freight included Name of Station: Northwest no. 2 Alternate no. 7 THIS IS A RE-BID OLD BID NUMBER WAS 50-117190	\$175,514.00 \$175,514.00	\$175,514.00 \$175,514.00
<i>Note: Exception to Xl. 01. Enclosure will be NEMA 3R instead of NEMA 4.</i>					

IX. Hydraulic System

1. The hydraulic pump shall be variable displacement hydraulic piston pump capable of continuous operation.
2. A hydraulic system monitoring device to allow diagnosing hydraulic system behavior even while pump is still submerged shall also be included.
3. The drive system shall include a "clutch" starting system which allows the prime mover to start under a no load condition and gradually engage the load over a 3 to 5 second time period. The "clutch" system shall be used to gradually disengage the load prior to shut off of the prime mover. An automatic system option is included.
4. Sufficient hydraulic oil cooling capacity shall be provided to sustain direct sunlight radiation as well as ambient temperatures up to 122°F (50°C).
5. Pumping units shall be open loop hydraulic circuit with system with a pilot operated relief valve to protect the system from over pressure.
6. Each hydraulic system shall be fitted with a suction strainer and a return filter to insure a supply of clean oil.

X. Alarms and shutdowns

The following alarms shall shut down the prime mover.

1. Low oil level in hydraulic reservoir
2. High hydraulic system temperature
3. High hydraulic pump suction vacuum
4. Diesel engine high coolant temp
5. Diesel engine low oil shutdown

XI. Variable Speed Controller

- I. Each drive unit shall be outfitted with "Electronic Proportional Displacement Control" which will use a 4-20mA signal to control the stroke of the hydraulic piston pump. The servo line maximum pressure and maximum stroke shall be factory set and may not be altered.
- II. The pump ramp controller enclosure shall be made of heavy duty polycarbonate with a NEMA 4X rating and lockable door. The control center shall be mounted allowing easy access.

Note: Exception - Enclosure will be NEMA 3R.

Non-Public Works Bid**AFFIDAVIT**STATE OF LouisianaPARISH/COUNTY OF East Baton Rouge

BEFORE ME, the undersigned authority, personally came and appeared: Billy H. Guidry, (Affiant) who after being by me duly sworn, deposed and said that he/she is the fully authorized representative of Better Pumps & Solutions, LLC (Entity), the party who submitted a bid in response to Bid Number 50-00118484, to the Parish of Jefferson.

Affiant further said:

Campaign Contribution Disclosures

(Choose A or B, if option A is indicated please include the required attachment):

Choice A _____ Attached hereto is a list of all campaign contributions, including the date and amount of each contribution, made to current or former elected officials of the Parish of Jefferson by Entity, Affiant, and/or officers, directors and owners, including employees, owning 25% or more of the Entity during the two-year period immediately preceding the date of this affidavit or the current term of the elected official, whichever is greater. Further, Entity, Affiant, and/or Entity Owners have not made any contributions to or in support of current or former members of the Jefferson Parish Council or the Jefferson Parish President through or in the name of another person or legal entity, either directly or indirectly.

Choice B ✓ there are **NO** campaign contributions made which would require disclosure under Choice A of this section.

Debt Disclosures

(Choose A or B, if option A is indicated please include the required attachment):

Choice A _____ Attached hereto is a list of all debts owed by the affiant to any elected or appointed official of the Parish of Jefferson, and any and all debts owed by any elected or appointed official of the Parish to the Affiant.

Choice B ✓ There are **NO** debts which would require disclosure under Choice A of this section.

Affiant further said:

That Affiant has employed no person, corporation, firm, association, or other organization, either directly or indirectly, to secure the public contract under which he received payment, other than persons regularly employed by the Affiant whose services in connection with the construction, alteration or demolition of the public building or project or in securing the public contract were in the regular course of their duties for Affiant; and

[The remainder of this page is intentionally left blank.]

That no part of the contract price received by Affiant was paid or will be paid to any person, corporation, firm, association, or other organization for soliciting the contract, other than the payment of their normal compensation to persons regularly employed by the Affiant whose services in connection with the construction, alteration or demolition of the public building or project were in the regular course of their duties for Affiant.

Billy H. Guidry
Signature of Affiant

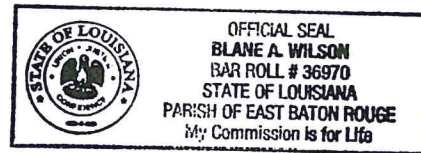
Billy H. Guidry
Printed Name of Affiant

SWORN AND SUBSCRIBED TO BEFORE ME
ON THE 24th DAY OF January, 2017.

[Signature]
Notary Public

Blane A. Wilson
Printed Name of Notary

36970
Notary/Bar Roll Number



My commission expires at death.

[Print](#)

Notary Search - Detail

Name: MR. BLANE WILSON
Address: 3015 SARPY AVENUE
BATON ROUGE, LA 70820

Phone: (225) 445-4001
Phone 2: (225) 445-4001

Notary ID Number: 146433
Parish: EAST BATON ROUGE with STATEWIDE JURISDICTION
Agency: N/A
Notary Type: Attorney
Bar Roll #: 36970

Status: Active

Commission Date: 08/30/2016
Oath Date: 08/02/2016
Surety Expiration Date: Not Required
Annual Report Current: Not Applicable

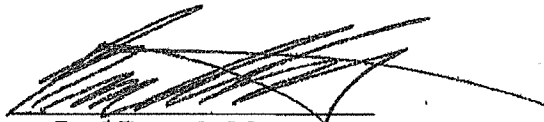
[Back to Search Results](#)[New Search](#)

**RESOLUTION OF THE MEMBERS
OF
BETTER PUMPS & SOLUTIONS, LLC**

A meeting of the Members of Better Pumps & Solutions, LLC was held on the 24 day of August, 2015 at which time the Members waived all requirements of notice of the date, time and place, as well as the purpose of the meeting and after being called to order by Brad Dutruch, Manager, the following resolutions were unanimously adopted:

ON MOTION DULY MADE AND SECONDED, IT WAS UNANIMOUSLY RESOLVED, that Joseph Atol, IV, is hereby appointed as a Manager of Better Pumps & Solutions, LLC, There being no further business before the Members, the meeting was adjourned.

There being no further business before the Members, the meeting was adjourned.


Brad Dutruch, Manager

CERTIFICATE

The above and foregoing is a true and correct copy of the Resolutions that were unanimously adopted by the Members of Better Pumps & Solutions, LLC. at a special meeting of the Members which was held the 24 day of August, 2015 attended by the Members after they had specifically waived all requirements for notice of the meeting and had consented for any business to be brought up before the meeting; and, since the adoption of this Resolution, it has neither been rescinded, vacated, nor set aside and accordingly remains in full force and effect.

Baton Rouge, Louisiana this 24 day of August, 2015.


Brad Dutruch, Manager

Tom Schedler
Secretary of State

**State of
Louisiana
Secretary of
State**



COMMERCIAL DIVISION
225.925.4704

Fax Numbers
225.932.5317 (Admin. Services)
225.932.5314 (Corporations)
225.932.5318 (UCC)

Name	Type	City	Status
BETTER PUMPS AND SOLUTIONS, LLC	Limited Liability Company	ST GABRIEL	Active

Previous Names

Business: BETTER PUMPS AND SOLUTIONS, LLC

Charter Number: 36385192K

Registration Date: 2/22/2007

Domicile Address

1285 BAYOU PAUL LN
ST GABRIEL, LA 70776

Mailing Address

C/O 1285 BAYOU PAUL LN
C/O 1285 BAYOU PAUL LN
ST GABRIEL, LA 70776

Status

Status: **Active**

Annual Report Status: **In Good Standing**

File Date: 2/22/2007

Last Report Filed: 1/28/2016

Type: Limited Liability Company

Registered Agent(s)

Agent:	R. GRAY SEXTON
Address 1:	8675 BLUEBONNET BLVD., STE. C
City, State, Zip:	BATON ROUGE, LA 70810
Appointment Date:	2/22/2007

Officer(s)

Additional Officers: No

Officer:	BRAD DUTRUCH
Title:	Member, Manager
Address 1:	15474 MANCHAC VIEW COURT
City, State, Zip:	BATON ROUGE, LA 70810
Officer:	LOUOLA, LLC

Title:	Member
Address 1:	76397 HIGHWAY 1077
City, State, Zip:	FOLSOM, LA 70427
Officer:	JOSEPH ATOL
Title:	Member
Address 1:	1285 BAYOU PAUL LANE
City, State, Zip:	ST. GABRIEL, LA 70776
Officer:	BILLY GUIDRY
Title:	Member
Address 1:	1285 BAYOU PAUL LANE
City, State, Zip:	ST. GABRIEL, LA 70776
Officer:	JOSEPH ATOL, IV
Title:	Manager, Member
Address 1:	1285 BAYOU PAUL LN
City, State, Zip:	ST GABRIEL, LA 70776

Amendments on File (2)

Description	Date
Appointing, Change, or Resign of Officer	1/9/2015
Appointing, Change, or Resign of Officer	8/26/2015

[Print](#)

207556

Form W-9
(Rev. December 2011)
Department of the Treasury
Internal Revenue Service

**Request for Taxpayer
Identification Number and Certification**

Give Form to the requester. Do not send to the IRS.

Name (as shown on your income tax return)
Better Pumps & Solutions, LLC

Business name/disregarded entity name, if different from above

Check appropriate box for federal tax classification:
☐ Individual/sole proprietor ☒ Corporation ☐ S Corporation ☐ Partnership ☐ Trust/estate
☐ Limited liability company. Enter the tax classification (C=C corporation, S=S corporation, P=partnership) ▶ ☐ Exempt payee
☐ Other (see instructions) ▶

Address (number, street, and apt. or suite no.)
1285 Bayou Paul Lane
City, state, and ZIP code
St. Gabriel, LA 70776

Requester's name and address (optional)

List account number(s) here (optional)

Part I Taxpayer Identification Number (TIN)

Enter your TIN in the appropriate box. The TIN provided must match the name given on the "Name" line to avoid backup withholding. For individuals, this is your social security number (SSN). However, for a resident alien, sole proprietor, or disregarded entity, see the Part I Instructions on page 3. For other entities, it is your employer identification number (EIN). If you do not have a number, see How to get a TIN on page 3.

Note. If the account is in more than one name, see the chart on page 4 for guidelines on whose number to enter.

Social security number								
			-					
Employer identification number								
2	0	-	8	5	9	1	6	9

Part II Certification

Under penalties of perjury, I certify that:

- The number shown on this form is my correct taxpayer identification number (or I am waiting for a number to be issued to me), and
- I am not subject to backup withholding because: (a) I am exempt from backup withholding, or (b) I have not been notified by the Internal Revenue Service (IRS) that I am subject to backup withholding as a result of a failure to report all interest or dividends, or (c) the IRS has notified me that I am no longer subject to backup withholding, and
- I am a U.S. citizen or other U.S. person (defined below).

Certification instructions. You must cross out item 2 above if you have been notified by the IRS that you are currently subject to backup withholding because you have failed to report all interest and dividends on your tax return. For real estate transactions, item 2 does not apply. For mortgage interest paid, acquisition or abandonment of secured property, cancellation of debt, contributions to an individual retirement arrangement (IRA), and generally, payments other than interest and dividends, you are not required to sign the certification, but you must provide your correct TIN. See the instructions on page 4.

Sign Here Signature of U.S. person ▶ *Conda Crean* Date ▶ *1/27/14*

General Instructions

Section references are to the Internal Revenue Code unless otherwise noted.

Purpose of Form

A person who is required to file an information return with the IRS must obtain your correct taxpayer identification number (TIN) to report, for example, income paid to you, real estate transactions, mortgage interest you paid, acquisition or abandonment of secured property, cancellation of debt, or contributions you made to an IRA.

Use Form W-9 only if you are a U.S. person (including a resident alien), to provide your correct TIN to the person requesting it (the requester) and, when applicable, to:

- Certify that the TIN you are giving is correct (or you are waiting for a number to be issued),
- Certify that you are not subject to backup withholding, or
- Claim exemption from backup withholding if you are a U.S. exempt payee. If applicable, you are also certifying that as a U.S. person, your allocable share of any partnership income from a U.S. trade or business is not subject to the withholding tax on foreign partners' share of effectively connected income.

Note. If a requester gives you a form other than Form W-9 to request your TIN, you must use the requester's form if it is substantially similar to this Form W-9.

Definition of a U.S. person. For federal tax purposes, you are considered a U.S. person if you are:

- An individual who is a U.S. citizen or U.S. resident alien,
- A partnership, corporation, company, or association created or organized in the United States or under the laws of the United States,
- An estate (other than a foreign estate), or
- A domestic trust (as defined in Regulations section 301.7701-7).

Special rules for partnerships. Partnerships that conduct a trade or business in the United States are generally required to pay a withholding tax on any foreign partners' share of income from such business. Further, in certain cases where a Form W-9 has not been received, a partnership is required to presume that a partner is a foreign person, and pay the withholding tax. Therefore, if you are a U.S. person that is a partner in a partnership conducting a trade or business in the United States, provide Form W-9 to the partnership to establish your U.S. status and avoid withholding on your share of partnership income.

Cat. No. 10231X Form W-9 (Rev. 12-2011)

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Interactive TIN Session:Interactive Results

This screen provides you with the results of your TIN Match request. The 'Match Indicator' displays a code next to the TIN and name combination. Use the codes below to interpret your results:

- 0 = TIN and Name combination matches IRS records.
- 1 = TIN was missing or TIN not 9-digit numeric.
- 2 = TIN entered is not currently issued.
- 3 = TIN and Name combination does not match IRS records.
- 4 = Invalid TIN Matching request.
- 5 = Duplicate TIN Matching request.
- 6 = TIN and Name combination matches IRS SSN records.
- 7 = TIN and Name combination matches IRS EIN records.
- 8 = TIN and Name combination matches IRS SSN and EIN records.

Important: Before leaving this screen, you may want to do a Print Screen of the results. Once you exit this screen, the interactive results will no longer be available for viewing.

Using the TIN Matching system allows you to verify the accuracy of taxpayer TIN and name information prior to submitting information to IRS. Internal Revenue Code 6724 provides any penalties under Section 6721 may be waived if the filer shows the failure to file a correct TIN on an information return was due to reasonable cause and not willful neglect. Filers may prove due diligence and receive a waiver from proposed penalties if they prove the TIN and name combination they submitted matched IRS records. Providing a copy of the Print Screen of your Interactive Results will be considered proof of due diligence.

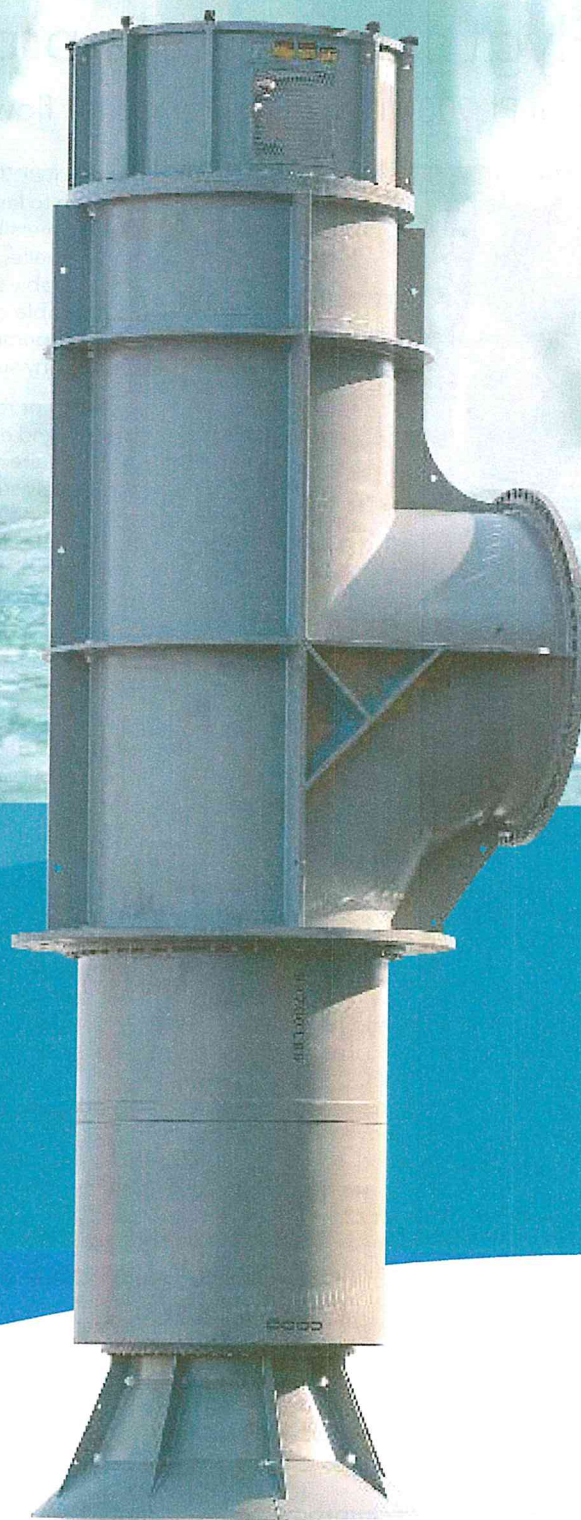
ID	TIN Type	TIN	Name	Result Code
1	Unknown	203927612	RV CAMS INC	7
2	Unknown	232082171	ATLANTIC TACTICAL INC	7
3	Unknown	320186386	APC CONSTRUCTION LLC	7
4	Unknown	953936623	BENTLEY SYSTEMS INC	7
5	Unknown	208591699	BETTER PUMPS & SOLUTIONS LLC	7
6	Unknown	453615978	MINUTILLO FAMILY HOLDINGS LLC	7
7	Unknown	720741965	GOVERNOR SPECIALISTS INC	7
8	Unknown	810604078	EASY WAY SAFETY SERVICES INC	7
9	Unknown	721215914	PRESTIGE CUSTOMS & AUTOSOUND INC	7
10	Unknown	261187694	THE KUPCAKE FACTORY LLC	7

You may do either of the following:

- Select *Another Tin Matching Request* to check more TIN and Name combinations.
- Select *Done* to return to the TIN Matching home page.

[ANOTHER TIN MATCHING REQUEST](#)[DONE](#)

[IRS Privacy Policy](#) | [Privacy Notice](#)
tin-match-rup-webapp (version R-14.1.1)



Flygt Vertical Pumps

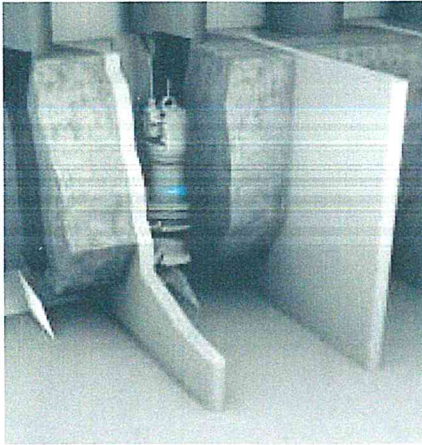
PL7000, LL 3000, WC,
YDD, WMC and VIT

SUBMERSIBLE AND WET PIT INSTALLATION

FLYGT
a xylem brand

Flygt submersible propeller pumps

Flygt PL 7000 Low Head Pumps for flows from 4,280 - 119,000 gpm



The Flygt PL 7000 range transports medium to large volumes at low heads. The submersible IP 68 motor and slim Propeller hydraulic provides a considerably smaller footprint than non-submersible pumps, enabling compact, low-cost pumping stations which do not require any superstructure.

Installing or removing the Flygt PL 7000 is quick and easy, with no fastening bolts required. The pump is always completely submerged when operating, which makes it less complex to install and enables the motor to run cooler and more quietly than a non-submersible propeller pump.

Every Flygt pump is factory-tested to ensure high performance and premium quality. Flygt submersible propeller pumps deliver cost-effective performance, proven for more than 50 years in applications such as:

- Storm water lifting stations
- Transport of screened wastewater
- Pump stations for cooling water and irrigation
- Flood control and dewatering
- Artificial wild water and surf rides
- Recirculation of activated sludge
- Seawater intake stations

TECHNICAL FEATURES

PERFECT MOTOR COOLING

Designed and manufactured in-house, our motor concentrates heat losses around the stator to provide enhanced cooling. Trickle impregnated with Class H insulating resin, the stator windings are rated at 180°C (355°F) and enable up to 15 starts per hour.

COMPLIANCE

Each pump is tested and approved in accordance with national and international standards, including IEC 34-1 and CSA. Pumps are available in explosion-proof versions and are approved by the Factory Mutual, European Standard and IEC.

CORROSION RESISTANT DESIGN

The shaft and propeller are made of corrosion-resistant material. Depending on the content of chlorides and liquid temperature, the pumps can be equipped with zinc anodes while cast iron wet parts can be painted with different epoxy coatings. The smaller PL 7020-7040 are equipped with bell mouth wear rings made of hard iron.

SELF-CLEANING N-TECHNOLOGY

Flygt propeller pumps can be equipped with N-technology for maximum non-clog performance and sustained efficiency. This innovative blade design sweeps debris away to a relief groove in the wear ring where the strong turbulent flow forces it along guide vanes out of the pump housing.

SPECIALLY DESIGNED CABLE

The Flygt SUBCAB® cable, specially designed for submersible applications, offers a special tear- and abrasion-resistant compound with a much higher tensile strength than conventional standard cables.

DOUBLE SEALED CABLE ENTRY

The cable entry provides sealing and strain relief functions for safe installation.

LARGE CHOICE OF SENSORS

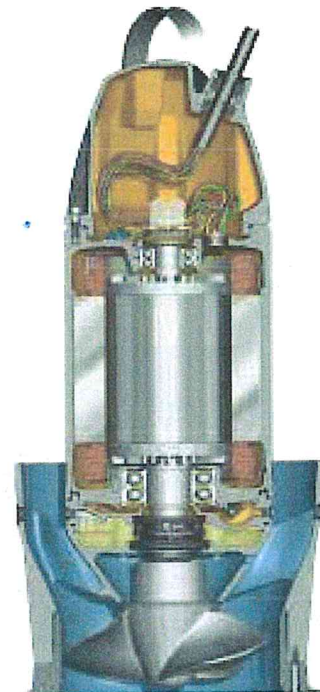
In addition to the standard thermal switches in the stator windings and the sensor in the leakage chamber, the motor can be equipped with analogue sensors (PT 100) to measure the temperature in the bearings and/or in the stator housing. Vibration and leakage sensors can also be placed in the junction box. All sensors can be monitored using the Flygt MAS or MiniCas control units.

LONG-LIFE BEARINGS

Durable bearings provide a minimum service life of 100,000 hours.

RELIABLE SEALS

Two sets of mechanical shaft seals work independently for double security. The Active Seal™ system offers increased sealing reliability and zero leakage into the motor, reducing the risk of bearing and stator failure. Seal rings are available in corrosion resistant tungsten carbide (WCCr) or Silicon carbide (SiC).

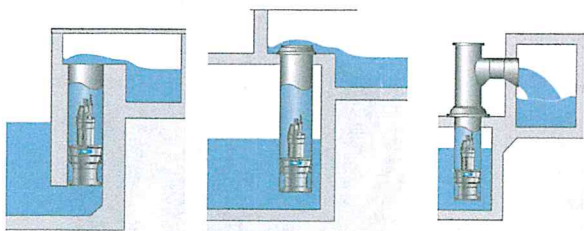


Flygt PL 7000 capacities and sizes

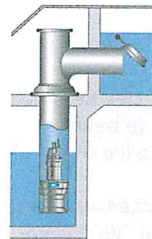
Model	max. Capacity (at 60 Hz)	Head range	Motor (60Hz) hp / rpm	Discharge tube inch	Diffuser material	Propeller material
PL 7020	5,070 gpm	3-15 ft.	27 hp / 1155	16"	Hard-Iron™	Stainless Steel
PL 7020	7,150 gpm	10-30 ft.	40 hp / 1750	16"	Hard-Iron™	Stainless Steel
PL 7030	7,950 gpm	5-16 ft.	26 hp / 1165	20"	Hard-Iron™	Stainless Steel
PL 7030	9,500 gpm	5-18 ft.	38 hp / 1165	20"	Hard-Iron™	Stainless Steel
PL 7030	11,400 gpm	5-20 ft.	50 hp / 1165	20"	Hard-Iron™	Stainless Steel
PL 7035	12,700 gpm	10-39 ft.	90 hp / 1750	22"	Hard-Iron™	Stainless Steel
PL 7035	12,700 gpm	10-46 ft.	115 hp / 1750	22"	Hard-Iron™	Stainless Steel
PL 7035	12,700 gpm	10-53 ft.	150 hp / 1750	22"	Hard-Iron™	Stainless Steel
PL 7040	12,700 gpm	5-12 ft.	40 hp / 880	24"	Hard-Iron™	Stainless Steel
PL 7040	14,600 gpm	5-16 ft.	75 hp / 880	24"	Hard-Iron™	Stainless Steel
PL 7040	17,500 gpm	7-23 ft.	80 hp / 1190	24"	Hard-Iron™	Stainless Steel
PL 7040	17,500 gpm	7-26 ft.	100 hp / 1190	24"	Hard-Iron™	Stainless Steel
PL 7040	19,800 gpm	7-26 ft.	125 hp / 1190	24"	Hard-Iron™	Stainless Steel
PL 7040	19,800 gpm	7-30 ft.	145 hp / 1190	24"	Hard-Iron™	Stainless Steel
PL 7061	19,800 gpm	7-21 ft.	85 hp / 880	32"	Cast iron	Bronze or SS
PL 7061	22,200 gpm	10-39 ft.	170 hp / 1185	32"	Cast iron	Bronze or SS
PL 7061	26,200 gpm	10-39 ft.	240 hp / 1185	32"	Cast iron	Bronze or SS
PL 7065	17,500 gpm	3-12 ft.	60 hp / 590	32"	Cast iron	Bronze or SS
PL 7065	21,400 gpm	3-18 ft.	110 hp / 705	32"	Cast iron	Bronze or SS
PL 7065	27,000 gpm	5-28 ft.	215 hp / 885	32"	Cast iron	Bronze or SS
PL 7076	17,500 gpm	3-12 ft.	65 hp / 590	40"	Cast iron	Bronze or SS
PL 7081	25,400 gpm	7-20 ft.	150 hp / 705	40"	Cast iron	Bronze or SS
PL 7081	31,700 gpm	10-30 ft.	250 hp / 880	40"	Cast iron	Bronze or SS
PL 7101	42,800 gpm	7-17 ft.	185 hp / 500	48"	Cast iron	Bronze or SS
PL 7101	49,100 gpm	10-25 ft.	335 hp / 590	48"	Cast iron	Bronze or SS
PL 7101	57,100 gpm	13-33 ft.	480 hp / 710	48"	Cast iron	Bronze or SS
PL 7105	63,400 gpm	8-20 ft.	230 hp / 505	48"	Cast iron	Bronze or SS
PL 7105	76,100 gpm	8-26 ft.	480 hp / 590	48"	Cast iron	Bronze or SS
PL 7121	83,200 gpm	10-28 ft.	600 hp / 505	56"	Cast iron	Bronze or SS
PL 7121	98,300 gpm	10-39 ft.	775 hp / 590	56"	Cast iron	Bronze or SS
PL 7125	119,000 gpm	8-33 ft.	600 hp / 505	56"	Cast iron	Bronze or SS

* For individual performance curves and dimensional drawings, go to www.xylect.com and the "Xylem design recommendations" booklet.

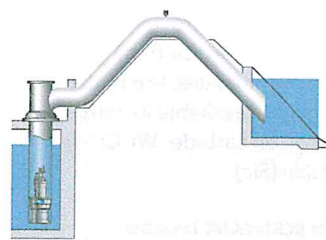
INSTALLATION EXAMPLES



Installation is steel, plastic or concrete column lifting to an open channel.
No check valve is required.



With submerged
outlet and flap valve.



With a siphon.

Flygt submersible mixed flow pumps

Flygt LL & NL 3000 Medium Head Pumps for flows from 1,110 - 34,900 gpm



For medium heads, Xylem offers the Flygt LL 3000 range with single or multi-vane impellers and axial flow diffusers. The NL 3000 range is equipped with our proven N-impeller technology.

Like all Flygt submersible column pumps, the LL/NL 3000 pumps enable the construction of low-cost pumping stations that do not require any superstructure. The pump is completely submerged, making it less complex to install and allowing the motors to run cooler and more quietly than non-submersible wet pit pumps.

Every Flygt pump is factory-tested to ensure high performance and premium quality. The LL/NL 3000 range has been proven for more than 50 years in applications such as:

- Storm water lifting stations
- Transport of screened wastewater
- Pump stations for cooling water
- Irrigation
- Flood control and dewatering
- Wild water rides in amusement parks
- Recirculation of activated sludge
- Seawater intake stations

TECHNICAL FEATURES

PERFECT MOTOR COOLING

The inhouse designed and manufactured motor provides enhanced cooling because heat losses are concentrated around the stator. Trickle impregnated with Class H insulating resin, the stator windings are rated at 180°C (355°F) and enable up to 15 starts per hour.

COMPLIANCE

Each pump is tested and approved in accordance with national and international standards, including IEC 34-1 and CSA. Pumps are available in explosion-proof versions and are approved by the Factory Mutual, European Standard and IEC.

RELIABLE SEALS

Two sets of mechanical shaft seals work independently for double security. The Active Seal™ system offers increased sealing reliability and zero leakage into the motor, thereby reducing the risk of bearing and stator failure. The material of the seal rings is available in corrosion resistant tungsten carbide (WCCr) or Silicon carbide (SiC).

CORROSION RESISTANT DESIGN

Depending on the content of chlorides and liquid temperature, the pumps can be equipped with zinc anodes and the impeller and shaft made of stainless steel. The cast iron wet parts can be painted with different epoxy coatings.

SPECIALLY DESIGNED CABLE

The Flygt SUBCAB® cable has been designed especially for submersible applications and offers a special tear and abrasion resistant compound with a much higher tensile strength compared to conventional standard cables.

DOUBLE SEALED CABLE ENTRY

The cable entry provides sealing and strain relief functions for safe installation.

LARGE CHOICE OF SENSORS

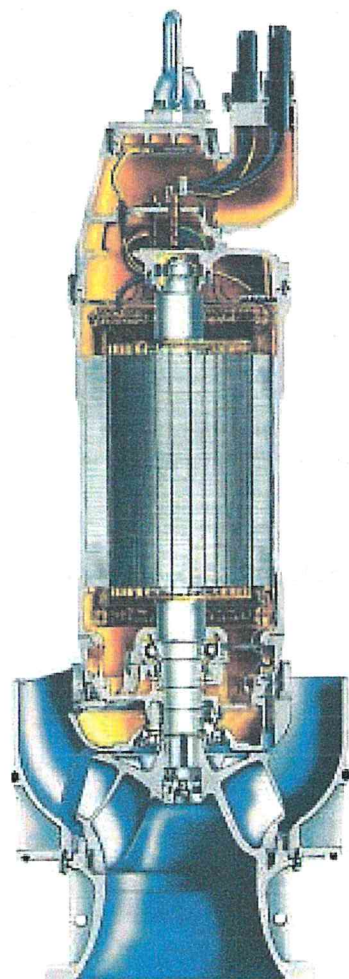
Beside the standardized thermal switches in the stator windings and the leakage sensor in the leakage chamber, the motor can be equipped with analogue sensors (PT 100) to measure the temperature in the bearings and/or in the stator housing. In addition to these, a vibration and a leakage sensor can be placed in the junction box. To monitor the sensors, Flygt offers the Flygt MAS and MiniCas control units.

LONG-LIFE BEARINGS

Durable bearings provide a minimum service life of 100,000 hours.

SELF-CLEANING N-TECHNOLOGY

The NL 3000 is equipped with N-technology for maximum non-clog performance and sustained efficiency.

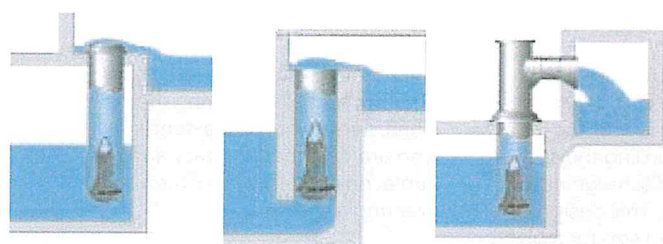


Flygt LL & NL 3000 capacities and sizes

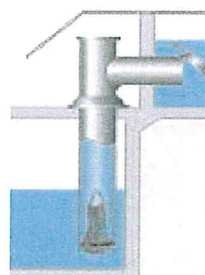
Model	max. Capacity (at 60 Hz)	Head range	Motor 60Hz hp / rpm	Discharge tube inch	Diffuser material	Propeller Material
NL 3102	1,110 gpm	5-25 ft.	5 hp / 1720	20"	Cast iron	Cast iron or SS
NL 3127	1,450 gpm	5-28 ft.	10 hp / 1735	24"	Cast iron	Cast iron or SS
LL 3152	3,800 gpm	5-21 ft.	14 hp / 1155	24"	Cast iron	Cast iron or SS
LL 3201	5,700 gpm	7-31 ft.	30 hp / 855	32"	Cast iron	Cast iron or SS
LL 3300	8,560 gpm	10-49 ft.	60 hp / 870	32"	Cast iron	Cast iron or SS
NL 3300	8,250 gpm	10-75 ft.	60 hp / 875	32"	Cast iron	Cast iron or SS
NL 3300	8,250 gpm	10-75 ft.	75 hp / 1170	32"	Cast iron	Cast iron or SS
LL 3356	8,900 gpm	16-69 ft.	135 hp / 880	32"	Cast iron	Cast iron or SS
LL 3356	12,050 gpm	26-125 ft.	310 hp / 1185	32"	Cast iron	Cast iron or SS
LL 3400	9,500 gpm	12-26 ft.	60 hp / 505	36"	Cast iron	Cast iron or SS
LL 3400	11,000 gpm	13-36 ft.	110 hp / 590	36"	Cast iron	Cast iron or SS
LL 3400	13,300 gpm	16-53 ft.	150 hp / 705	36"	Cast iron	Cast iron or SS
LL 3400	16,600 gpm	26-85 ft.	355 hp / 880	36"	Cast iron	Cast iron or SS
LL 3602	24,600 gpm	10-36 ft.	185 hp / 500	48"	Cast iron	Cast iron or SS
LL 3602	29,300 gpm	16-49 ft.	310 hp / 590	48"	Cast iron	Cast iron or SS
LL 3602	34,900 gpm	20-72 ft.	565 hp / 710	48"	Cast iron	Cast iron or SS

* For individual performance curves and dimensional drawings, go to www.xylect.com and the "Xylem design recommendations" booklet.

INSTALLATION EXAMPLES



Installation in steel, plastic or concrete column lifting to an open channel.
No check valve is required.



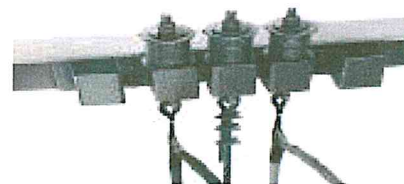
With submerged outlet
and flap valve.



With a siphon.

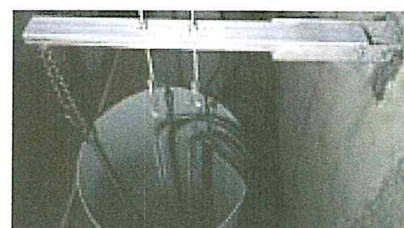
Customized column pipes in various materials

The material of the column pipe has an important influence on the corrosion resistance of the pump and the cost of the complete pump station. Xylem offers galvanized steel column pipes for water or wastewater and column pipes made of glass reinforced polymer (GRP) for installation in sea water.



Submersible Column Pump Accessories

Xylem offers advanced cable protection and suspension systems as well as special pump lifting for Flygt PL 7000 and LL/NL 3000. For detailed information, ask for the "Xylem design recommendations" booklet.



Flygt A-C Series customized column pumps

Flygt WCA, WCAX, WCB, WCF and YDD Low and Medium Head Pumps
for flows from 30,000 - 370,000 gpm



The transport of large flows requires large hydraulics and motors with the highest efficiency. Even a small increase in efficiency translates into considerable cost-savings. While well-approved submersible motors are available up to 700 KW, a wet pit column pump can offer unlimited motor power to reach theoretically unlimited flows.

Backed by over 130 years of experience, the Flygt A-C series column pumps (formerly known as Allis-Chalmers or A-C pump) can offer hydraulic efficiencies up to 92% to almost any required duty point between 10 to 110 feet of head. Heavy-duty construction, the cast bowl components and a conservative mechanical design

minimize vibration, delivering long-term, trouble-free operation.

Flygt customized column pumps can be delivered in any cast or fabricated material, making them the perfect choice for applications such as:

- Circulating water in power stations
- Municipal and industrial water supply
- Transport of screened wastewater
- Irrigation
- Flood control
- Seawater intake for desalination and power plants

TECHNICAL FEATURES

DRIVER PEDESTAL

Substantial openings provide easy access to the adjustable coupling and stuffing box.

STUFFING BOX

Packed with graphite-impregnated PTFE material, it reduces resistance and prolongs shaft sleeve life. An easily accessible split gland simplifies packing adjustment and replacement.

SHAFT TUBE

Shaft tubes protect shafts from the pumped fluid and provide a passage for bearing lubrication. Open lineshaft pumps (without shaft tubes) can be provided for self-lubricated pumping applications.

INTERMEDIATE COUPLING

When required, this solid sleeve provides a rigid transmission of power and torque through the shafts. The coupling is positively driven via coupling keys and transmits thrust loads via the split thrust ring design.

MOTOR & CONTROL EQUIPMENT

Xylem has partnerships with leading manufacturers of NEMA or IEC motors and can deliver the pump with any motor including required accessories such as noise protection and monitoring and control systems.

PULL-OUT DESIGN

The pull-out design substantially reduces maintenance and downtime costs by allowing removal of the inner element without disturbing the suction bell, column pieces, discharge elbow, and discharge piping. This design does not affect column size for a given capacity and there is no sacrifice in pumping performance. The sliding and conical fits assure proper alignment upon reassembly. The inner element is completely removable through the top of the pump, thus eliminating the need to drain or enter the sump during maintenance.

BEARINGS

Upper and lower bearings are rigidly mounted from the top of the pump and diffuser. The impeller is overhung from the diffuser bearing to increase efficiency and reduce clogs. Bearing spacing is conservatively designed using a lateral critical speed analysis. When required, intermediate bearings are installed and supported via bearing spiders fitted to the column pipe. Bearings are typically either fluted rubber or elastomeric sleeve-type bearings designed for water lubrication. Grease lubricated bearings are also an option.

SHAFT SLEEVES

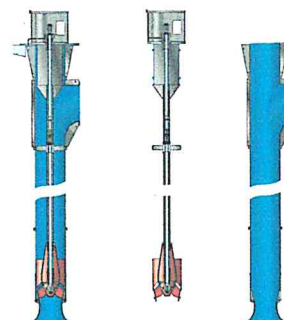
Shaft sleeves are provided under the packing and at all bearing locations. Shaft sleeves provide extended wear life and are designed for easy and low-cost replacement/renewal of the wearing surfaces.

IMPELLER

Impellers are cast in a single piece. The vanes are formed by accurately set cores to assure even thickness and vane spacing. Impellers are balanced to an ISO/ANSI G2.5 quality level.

IMPELLER CONE

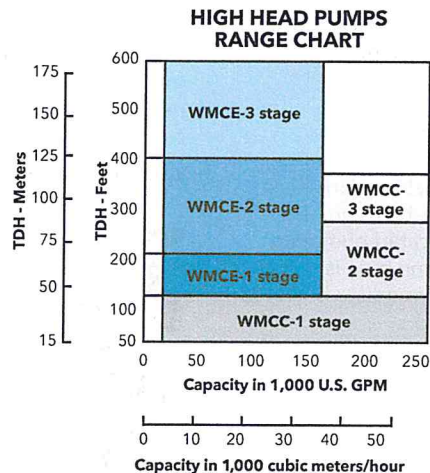
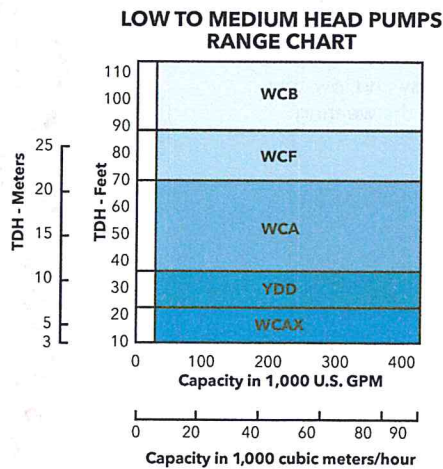
The impeller cone is a separate hydraulic component, cast in the same material as the impeller for long life wear and reduced downtime. The design allows for economical renewal of clearances.



Flygt WC & YDD capacities and sizes

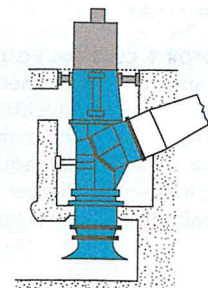
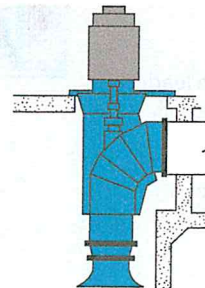
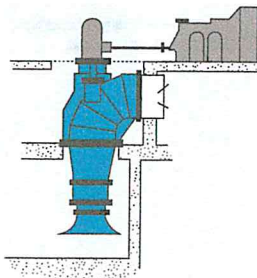
Model	Designed capacity	Discharge size inch	Suction bell size inch	Diffuser Material	Impeller Material	Optional Materials for impeller, diffuser & all wet parts
42x30 WCA/B/F	30,000 gpm	30"	42"	Ductile Iron	AISI 304L	Bronze /AISI 316 or S. Duplex
48x36 WCA/B/F	40,000 gpm	36"	48"	Ductile Iron	AISI 304L	Bronze /AISI 316 or S. Duplex
54x42 WCA/B/F	55,500 gpm	42"	54"	Ductile Iron	AISI 304L	Bronze /AISI 316 or S. Duplex
66x48 WCA/B/F	74,500 gpm	48"	66"	Ductile Iron	AISI 304L	Bronze /AISI 316 or S. Duplex
72x54 WCA/B/F	90,500 gpm	54"	72"	Ductile Iron	AISI 304L	Bronze /AISI 316 or S. Duplex
84x60 WCA/B/F	114,000 gpm	60"	84"	Ductile Iron	AISI 304L	Bronze /AISI 316 or S. Duplex
90x66 WCA/B/F	139,500 gpm	66"	90"	Ductile Iron	AISI 304L	Bronze /AISI 316 or S. Duplex
102x72 WCA/B/F	165,000 gpm	72"	102"	Ductile Iron	AISI 304L	Bronze /AISI 316 or S. Duplex
108x78 WCA/B/F	190,000 gpm	78"	108"	Ductile Iron	AISI 304L	Bronze /AISI 316 or S. Duplex
120x84 WCA/B/F	220,000 gpm	84"	120"	Ductile Iron	AISI 304L	Bronze /AISI 316 or S. Duplex
138x96 WCA	290,000 gpm	96"	138"	Ductile Iron	AISI 304L	Bronze /AISI 316 or S. Duplex
156x108 WCA	370,000 gpm	108"	156"	Ductile Iron	AISI 304L	Bronze /AISI 316 or S. Duplex
78x54 YDD	90,500 gpm	54"	78"	Ductile Iron	AISI 304L	Bronze /AISI 316 or S. Duplex
90x60 YDD	114,000 gpm	60"	90"	Ductile Iron	AISI 304L	Bronze /AISI 316 or S. Duplex
96x66 YDD	140,000 gpm	66"	96"	Ductile Iron	AISI 304L	Bronze /AISI 316 or S. Duplex
108x72 YDD	165,000 gpm	72"	108"	Ductile Iron	AISI 304L	Bronze /AISI 316 or S. Duplex
114x78 YDD	190,000 gpm	78"	114"	Ductile Iron	AISI 304L	Bronze /AISI 316 or S. Duplex
126x84 YDD	220,000 gpm	84"	126"	Ductile Iron	AISI 304L	Bronze /AISI 316 or S. Duplex
144x96 YDD	290,000 gpm	96"	144"	Ductile Iron	AISI 304L	Bronze /AISI 316 or S. Duplex
156x108 YDD	370,000 gpm	108"	156"	Ductile Iron	AISI 304L	Bronze /AISI 316 or S. Duplex

*The listed sizes can change depending on the duty point and speed. For detailed curves, contact your local Xylem representative.



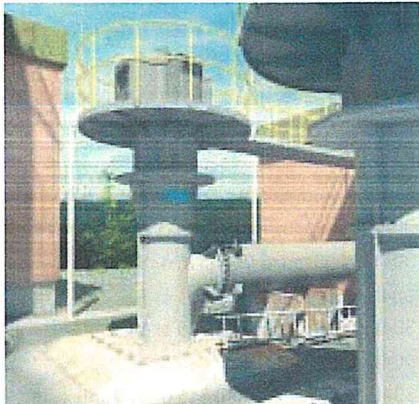
INSTALLATION EXAMPLES

The discharge can be offered in casted or fabricated steel with a flange acc. any standard. The outlet can be either above or below the floor or even angled.



Flygt A-C Series multistage column pumps

Flygt WMCC, WMCE and FLYGT VIT High Head Pumps for flows from 1,600 - 200,000 gpm



With the flexible Flygt WMC and VIT wet pit column pumps, Xylem offers a highly efficient hydraulic at almost any high-head duty point. The enclosed impeller, multistage diffuser, shaft and column are available in a wide range of materials.

The smaller, standardized Flygt VIT offers bowl sizes up to 55" for heads up to 3,500 ft and flows up to 40,000 USgpm. The larger, customized Flygt WMC can be supplied with three stages to reach heads up to 570 ft and flows up to 220,000 USgpm.

Backed by 130 years of experience and more than 7,000 customized pump installations, Xylem (formerly A-C pump) is the ideal choice for a variety of applications including:

- Circulating water in power station
- Municipal and industrial water supply
- Agriculture irrigation
- Seawater intake to desalination and power plants

TECHNICAL FEATURES

DRIVER PEDESTAL

Substantial openings provide easy access to the adjustable coupling and stuffing box.

STUFFING BOX

Packed with graphite impregnated PTFE material, it reduces resistance and prolongs shaft sleeve life. An easily accessible split gland simplifies packing adjustment and replacement.

SHAFT TUBE

Shaft tubes protect shafts from the pumped fluid and provide a passage for bearing lubrication. Open lineshaft pumps (without shaft tubes) can be provided for self-lubricated pumping applications. The column pipe is made in sections so that intermediate bearings can be used if required.

INTERMEDIATE COUPLING

This solid sleeve provides a rigid transmission of power and torque through the shafts. The coupling is positively driven via coupling keys and transmits thrust loads via the split thrust ring design.

MOTOR & CONTROL EQUIPMENT

Xylem has close partnerships with leading manufacturers of NEMA or IEC motors and can deliver the pump with any motor including all required accessories like noise protection or any kind of monitoring & control system.

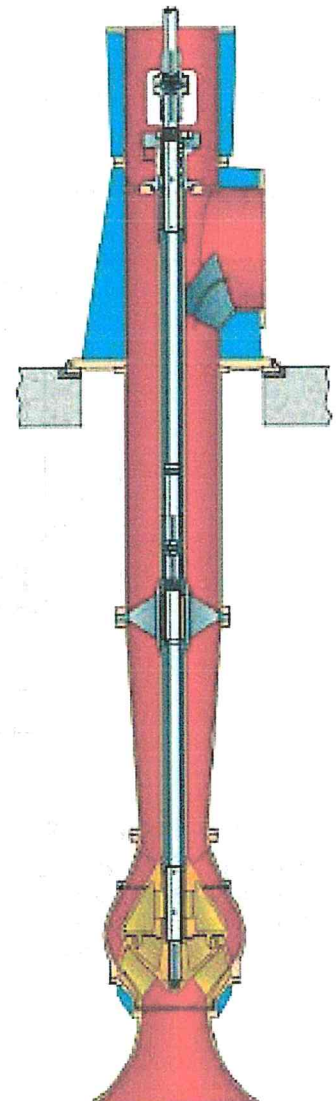
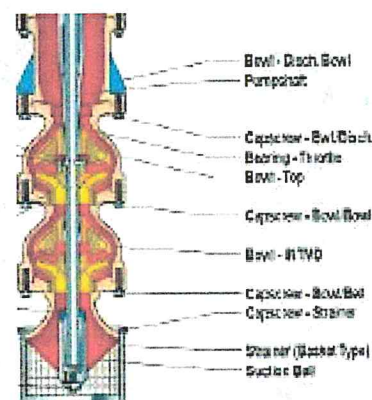
BEARINGS

The thrust-relief design of the Flygt WMC and the Flygt VIT creates low thrust values from maximum flow to shut-off head. This prolongs the service life of the thrust bearing.

SHAFT SLEEVES

Shaft sleeves are provided under the packing and at all bearing locations. The shaft sleeves provide extended wear life and are designed for easy and low cost replacement/renewal of the wearing surfaces.

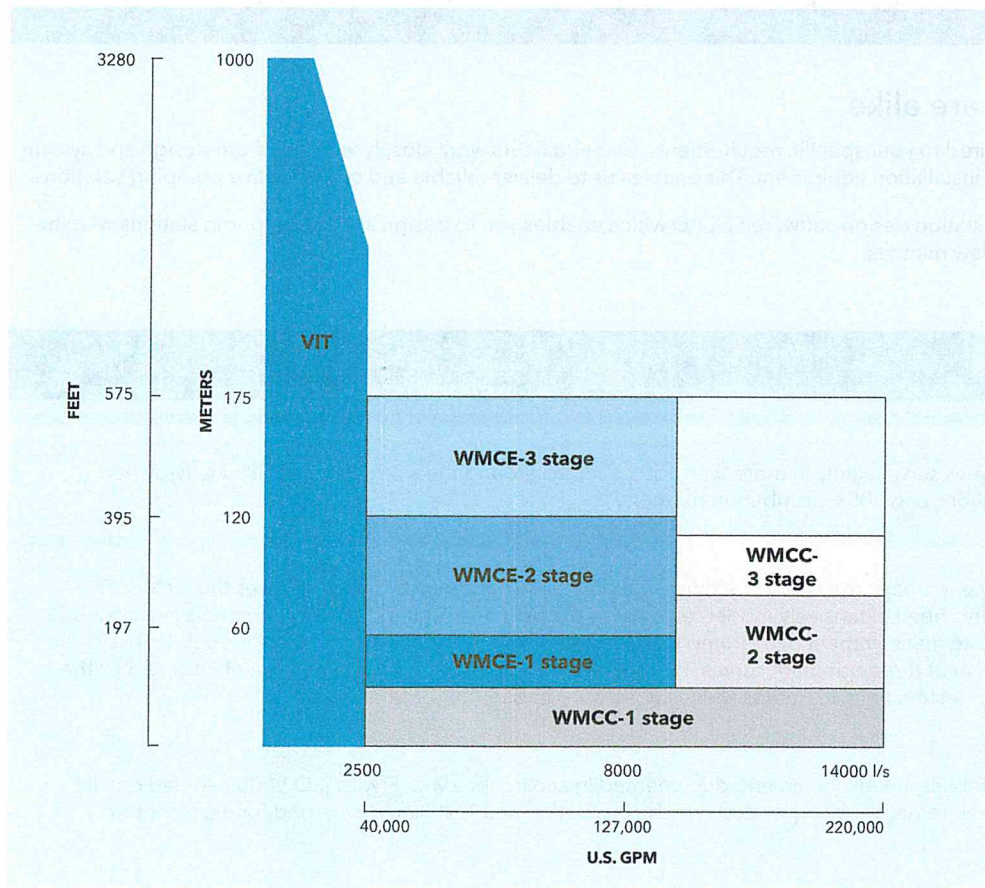
MULTI STAGE DESIGN



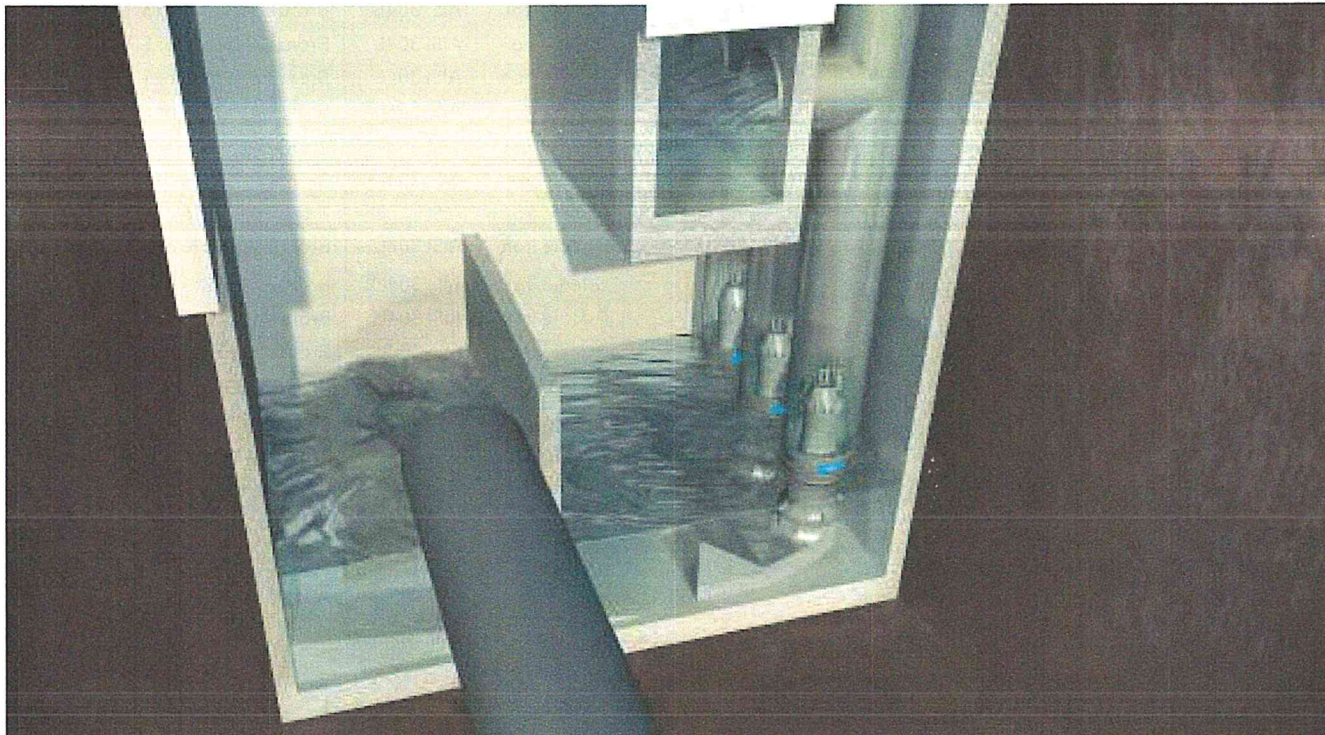
Flygt WMC & VIT capacities and sizes

Model	Designed capacity	Discharge size inch	Suction bell size inch	Diffuser Material	Impeller Material	Optional Materials for impeller, diffuser & all wet parts
FLYGT VIT range	1,600-40,000 gpm	30-55"	32-58"	Cast Iron	Al bronze	AISI 316, Duplex or Super Duplex
48x36 WMC	27,000 gpm	36"	48"	Ductile Iron	AISI 304L	Bronze /AISI 316 or S. Duplex
54x36 WMC	28,500 gpm	36"	54"	Ductile Iron	AISI 304L	Bronze /AISI 316 or S. Duplex
54x42 WMC	31,700 gpm	42"	54"	Ductile Iron	AISI 304L	Bronze /AISI 316 or S. Duplex
60x36 WMC	34,900 gpm	36"	60"	Ductile Iron	AISI 304L	Bronze /AISI 316 or S. Duplex
66x42 WMC	47,600 gpm	42"	66"	Ductile Iron	AISI 304L	Bronze /AISI 316 or S. Duplex
66x48 WMC	52,300 gpm	48"	66"	Ductile Iron	AISI 304L	Bronze /AISI 316 or S. Duplex
72x54 WMC	61,800 gpm	54"	72"	Ductile Iron	AISI 304L	Bronze /AISI 316 or S. Duplex
78x54 WMC	70,000 gpm	54"	78"	Ductile Iron	AISI 304L	Bronze /AISI 316 or S. Duplex
84x54 WMC	79,300 gpm	54"	84"	Ductile Iron	AISI 304L	Bronze /AISI 316 or S. Duplex
84x60 WMC	95,100 gpm	60"	84"	Ductile Iron	AISI 304L	Bronze /AISI 316 or S. Duplex
90x54 WMC	105,000 gpm	54"	90"	Ductile Iron	AISI 304L	Bronze /AISI 316 or S. Duplex
90x66 WMC	111,000 gpm	66"	90"	Ductile Iron	AISI 304L	Bronze /AISI 316 or S. Duplex
90x72 WMC	116,000 gpm	72"	90"	Ductile Iron	AISI 304L	Bronze /AISI 316 or S. Duplex
96x66 WMC	124,000 gpm	66"	96"	Ductile Iron	AISI 304L	Bronze /AISI 316 or S. Duplex
96x72 WMC	132,000 gpm	72"	96"	Ductile Iron	AISI 304L	Bronze /AISI 316 or S. Duplex
108x78 WMC	151,000 gpm	78"	108"	Ductile Iron	AISI 304L	Bronze /AISI 316 or S. Duplex
114x78 WMC	174,000 gpm	78"	114"	Ductile Iron	AISI 304L	Bronze /AISI 316 or S. Duplex
114x84 WMC	200,000 gpm	84"	114"	Ductile Iron	AISI 304L	Bronze /AISI 316 or S. Duplex

*The listed sizes can change depending on the duty point and speed. For detailed curves, contact your local Xylem representative.



Solutions engineered to your specific requirements



No two pump stations are alike

Flygt column pumps can be configured to your specific requirements. Our engineers work closely with you, from design and system analysis to selection of product and installation equipment. This enables us to deliver reliable and cost-effective pumping solutions.

Ask your Xylem office for the pump station design software SECAD which enables you to design state of art pump stations with the smallest possible footprint in just a few minutes.

The Flygt Advantage

GLOBAL PRESENCE:

More than 12,000 Xylem employees serve clients in more than 150 countries around the world through 38 wholly-owned direct sales and service organizations and 300+ distribution partners.

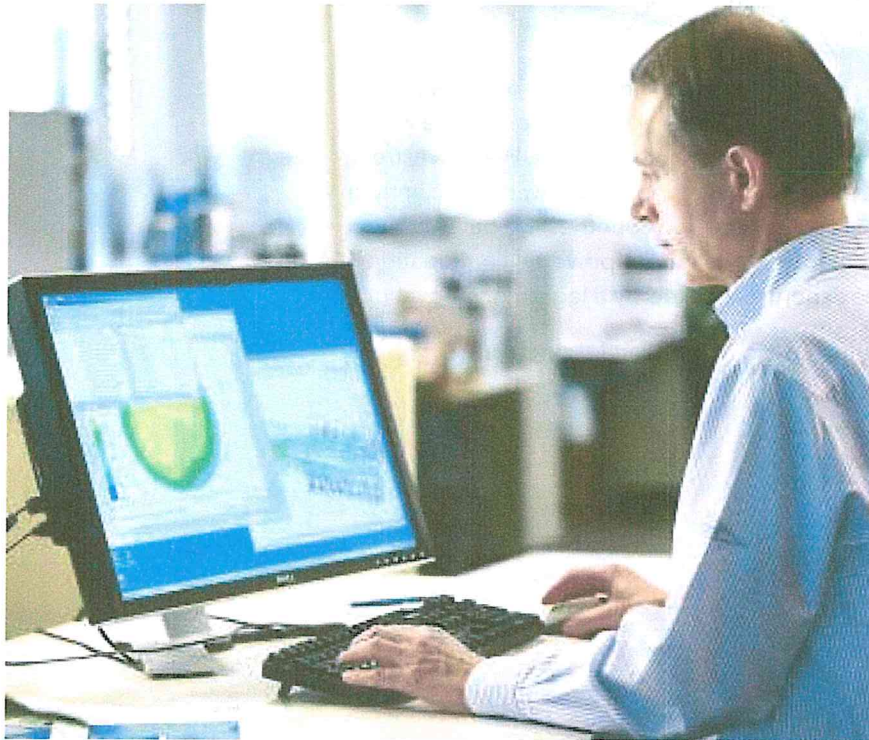
CERTIFIED PERFORMANCE:

Each Flygt column pump has to pass a performance test according to ISO and HI standards before it leaves the factory. The efficiency of each pump design has been extensively model-tested over the full range of impeller diameters/tilts in a closed loop system. This provides accurate measurement of all pump performance characteristics along with NPSHr values, hydraulic thrust values, and the development of three quadrant curves (Karman-Knapp curves). Our Vadodara/India plant operates the world's largest test pit, capable of testing full size pumps with a capacity up to 525,000 GPM or 7350 KW.

CERTIFIED QUALITY:

All pump components and assemblies are inspected and documented in accordance with Flygt's ISO 9000 certified quality program. Any special contract requirement is incorporated into the Inspection and Test Plan developed for each contract.

Supporting your business, every step of the way



Extensive engineering know-how

Xylem has extensive knowledge of fluid dynamics and vast practical experience in designing, operating and maintaining efficient wastewater transport systems. We provide a broad range of engineering services, including:

- System analysis and calculations
- Sump design
- Water hammer calculations
- Pump start & Critical speed analysis
- Transient analysis
- Computational Fluid Dynamics (CFD)
- Scale model testing

In short, we can assist you with everything you need for optimal performance and economical, energy-efficient operation.

Empower your system

With Flygt monitoring and control products, you can control and optimize the performance of every component of your system. This helps reduce stress on pumps, valves and mains, enabling reliable, efficient operation and prolonged service life.

Support for your Flygt pumps

Our global network of local service centers and service partners provide integrated services to support safe, efficient and reliable operation. To ensure trouble-free operation and minimal downtime, count on us for quick, professional response and quality maintenance services, using genuine Flygt spare parts.



Extensive monitoring and control

We supply hardware and software for complete process systems – from individual pump drives, starters, sensors and controllers to system software and scalable SCADA systems.



Genuine Flygt spare parts and warranty

When downtime isn't an option, rely on our global service network to deliver genuine Flygt spare parts to you – quickly and efficiently. All Flygt spare parts are backed by a solid 20-year availability guarantee.

Xylem |'zīləm|

- 1) The tissue in plants that brings water upward from the roots;
- 2) a leading global water technology company.

We're 12,000 people unified in a common purpose: creating innovative solutions to meet our world's water needs. Developing new technologies that will improve the way water is used, conserved, and re-used in the future is central to our work. We move, treat, analyze, and return water to the environment, and we help people use water efficiently, in their homes, buildings, factories and farms. In more than 150 countries, we have strong, long-standing relationships with customers who know us for our powerful combination of leading product brands and applications expertise, backed by a legacy of innovation.

For more information on how Xylem can help you, go to www.xyleminc.com



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www.xyleminc.com

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Godwin Variable Frequency Drive

Godwin variable frequency drives are designed to meet the demanding needs of the dewatering market. Available as either rental or sale units, our state-of-the-art variable frequency drive can automatically vary speed to maintain a process variable such as level or pressure. The panel mounted human machine interface (HMI) provides instant process feedback as well as local programming and control. Our VFD's are housed in a NEMA 3R steel enclosure featuring thermostatically controlled ventilation fans and a steel roll cage with lifting bail for stability and protection.

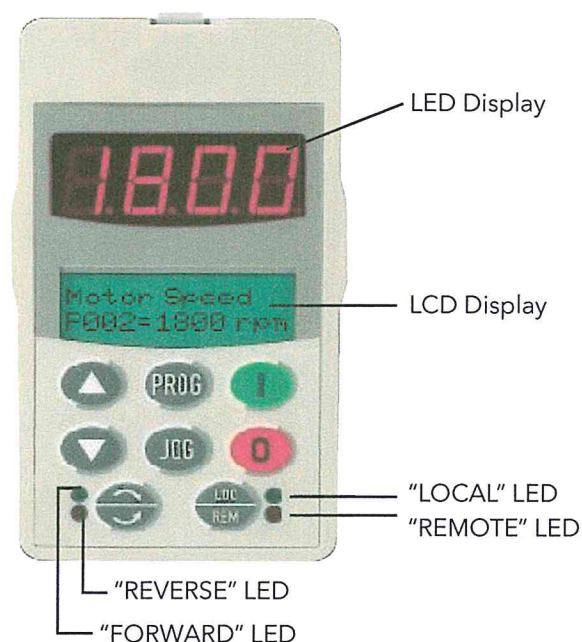
Features

- Microprocessor based "VFD" motor starter, capable of variable speed control
- Input Line Reactor
- Circuit Breaker w/thru-door disconnect
- Analog Input Isolators, with dedicated power supply, for PID
- Thermostat-controlled space heater and ventilation fan
- Fans and exhausts filtered, and covered with matching protective hoods.
- Local-Off-Remote selector switch
- Start and Stop pushbuttons for Local mode
- Potentiometer for setting speed in Local mode
- Drive Running and Drive Fault status lights
- Analog input, 4-20 mA, for PID mode
- Start and Stop inputs for Remote mode
- Dry contacts for monitoring: local mode selected, remote mode selected, Drive Ready, Drive Running, Drive Faulted
- Includes Steel Skid with Lifting Bracket



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Keypad



Keypad Options

Intelligent Keypad:

Intelligent operator interface with double display, LED (7 segment) and LCD (2 lines with 16 characters), providing optimum distant viewing along with a detailed description of all parameters and messages.

Selectable Language:

The language of the LCD display messages can be selected by the operator. English, Spanish and Portuguese are available.

Options for Advanced Control Panels

Networkable System:

Link VFDs with other drives and equipment like flowmeters, transducers and diesel pump sets with optional Advanced Control System. View and control an entire system with one central touchscreen.

Remote Access:

Link VFD to web based monitoring page with optional Advanced Control Panel. View the drive status and adjust settings from a remote location with the click of a button.

Specifications

Power		Current	Overall Dimension*		Weight**	
HP	kW	Amps	in x in x in	m x m x m	lb	kg
20	15	30	26 x 45 x 59	0.7 x 1.1 x 1.5	1,000	455
30	22	45	22 x 49 x 66	0.6 x 1.2 x 1.7	1,000	455
50	37	70	30 x 45 x 80	0.8 x 1.1 x 2.0	1,000	455
75	56	105	26 x 55 x 88	0.7 x 1.4 x 2.2	1,100	500
100	75	142	26 x 55 x 88	0.7 x 1.4 x 2.2	1,100	500
150	112	180	26 x 55 x 88	0.7 x 1.4 x 2.2	1,100	500
200	149	240	47 x 53 x 102	1.2 x 1.3 x 2.6	1,840	836
300	224	361	47 x 53 x 102	1.2 x 1.3 x 2.6	2,680	1,218
400	298	515	47 x 53 x 102	1.2 x 1.3 x 2.6	2,660	1,209

*Dimensions with Roll Cage
(D x W x L)

**Includes weight of Roll Cage



Dewatering Solutions
84 Floodgate Road
Bridgeport, NJ 08014
Tel +1.856.467.3636
www.godwinpumps.com

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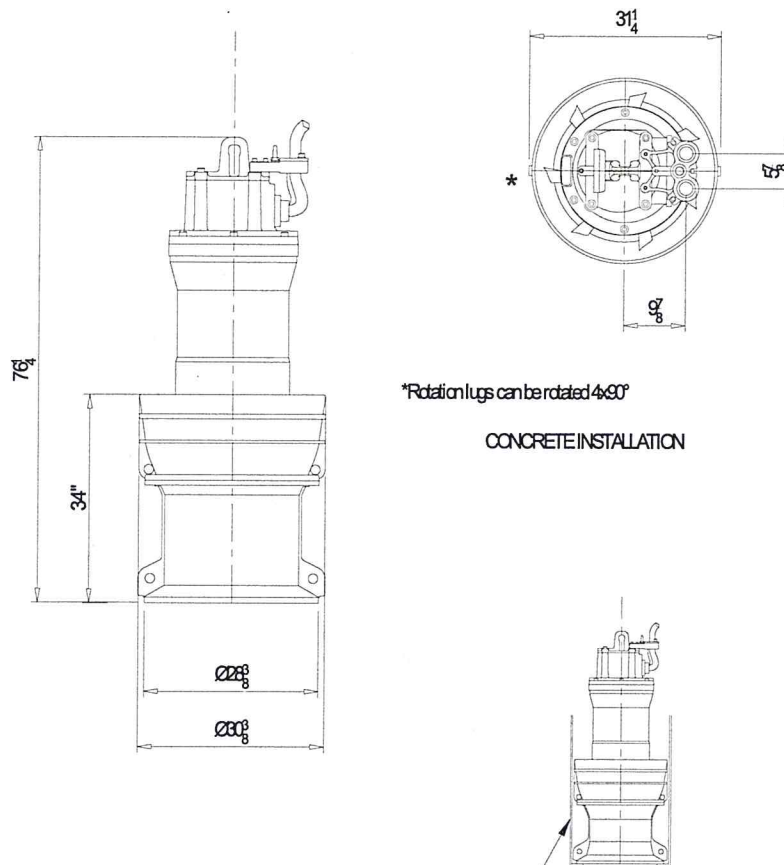
www.godwinpumps.com

Example of Carrier Pipe for Axial Flow Pump (base to be modified)



PL 7065/705 3~ 810

Dimensional drawing



SEE "FLYGT SYSTEM AND APPLICATION
ENGINEERING BULLETIN"



Denomination
Dimensional dwg
PL 7065 705715, 705716

Drawn by DS	Checked by	Date 130523
Scale	Reg no 5799	
7246800		3

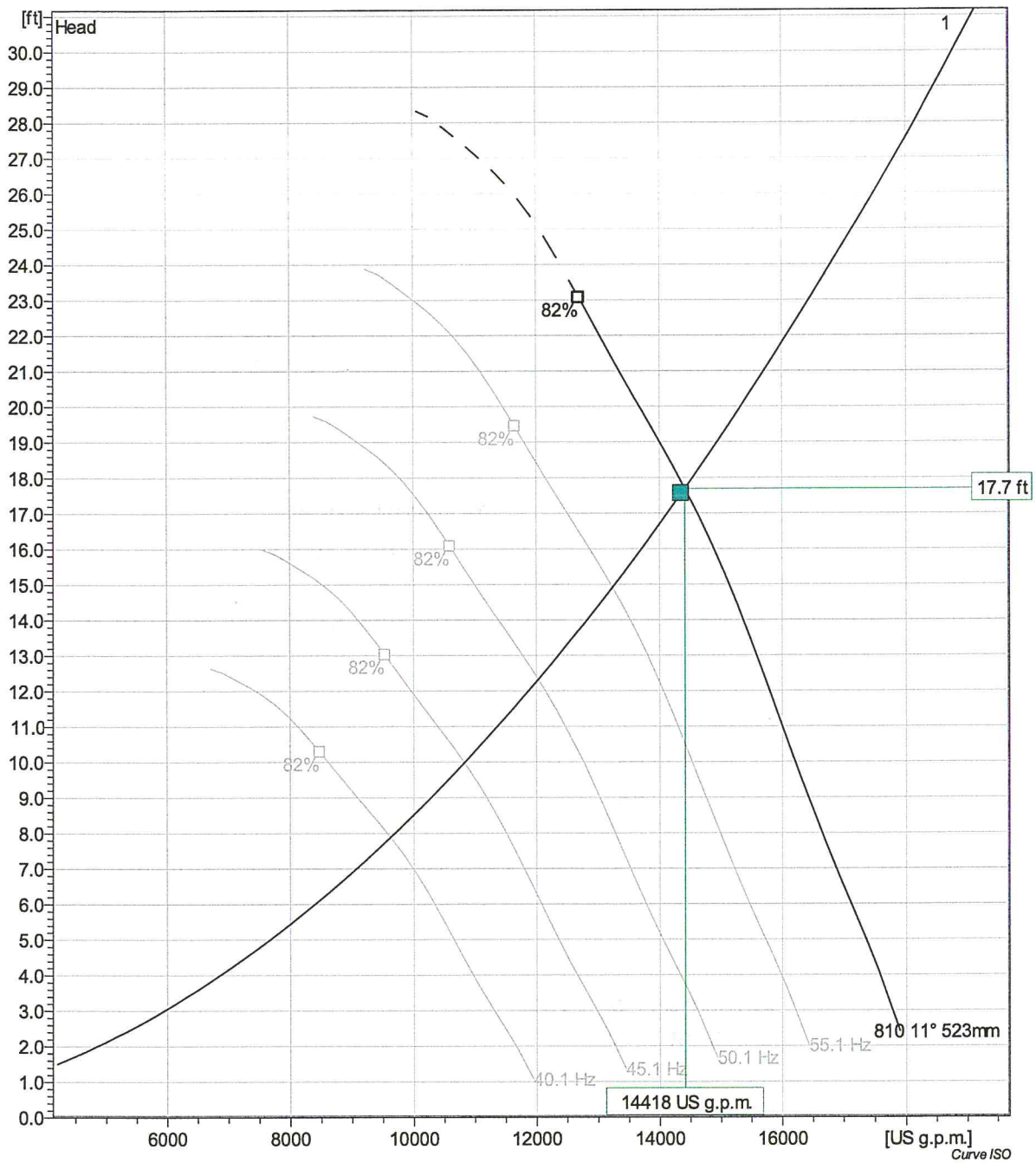
Project

Project ID

Created by

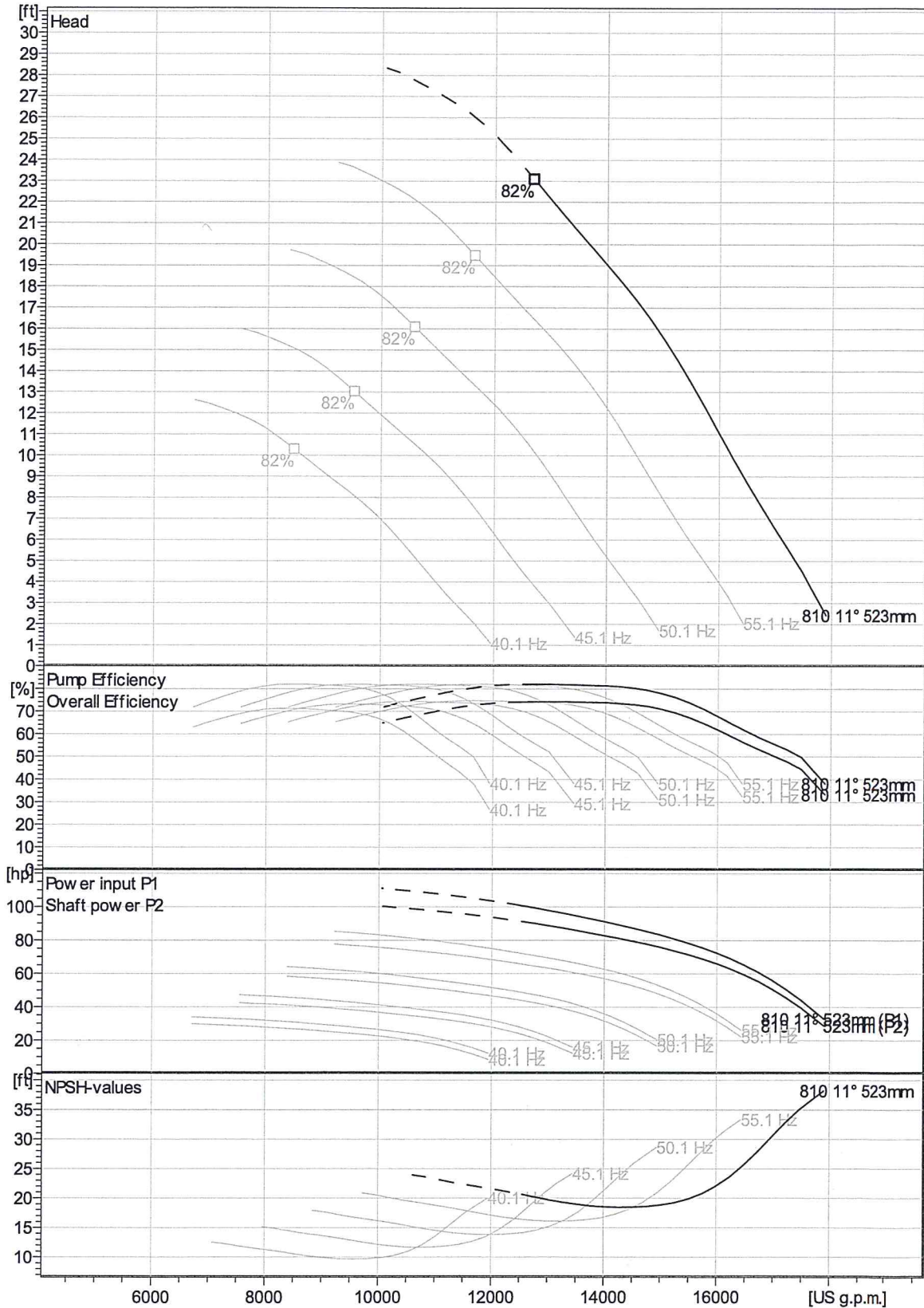
Created on
2017-01-19

Last update



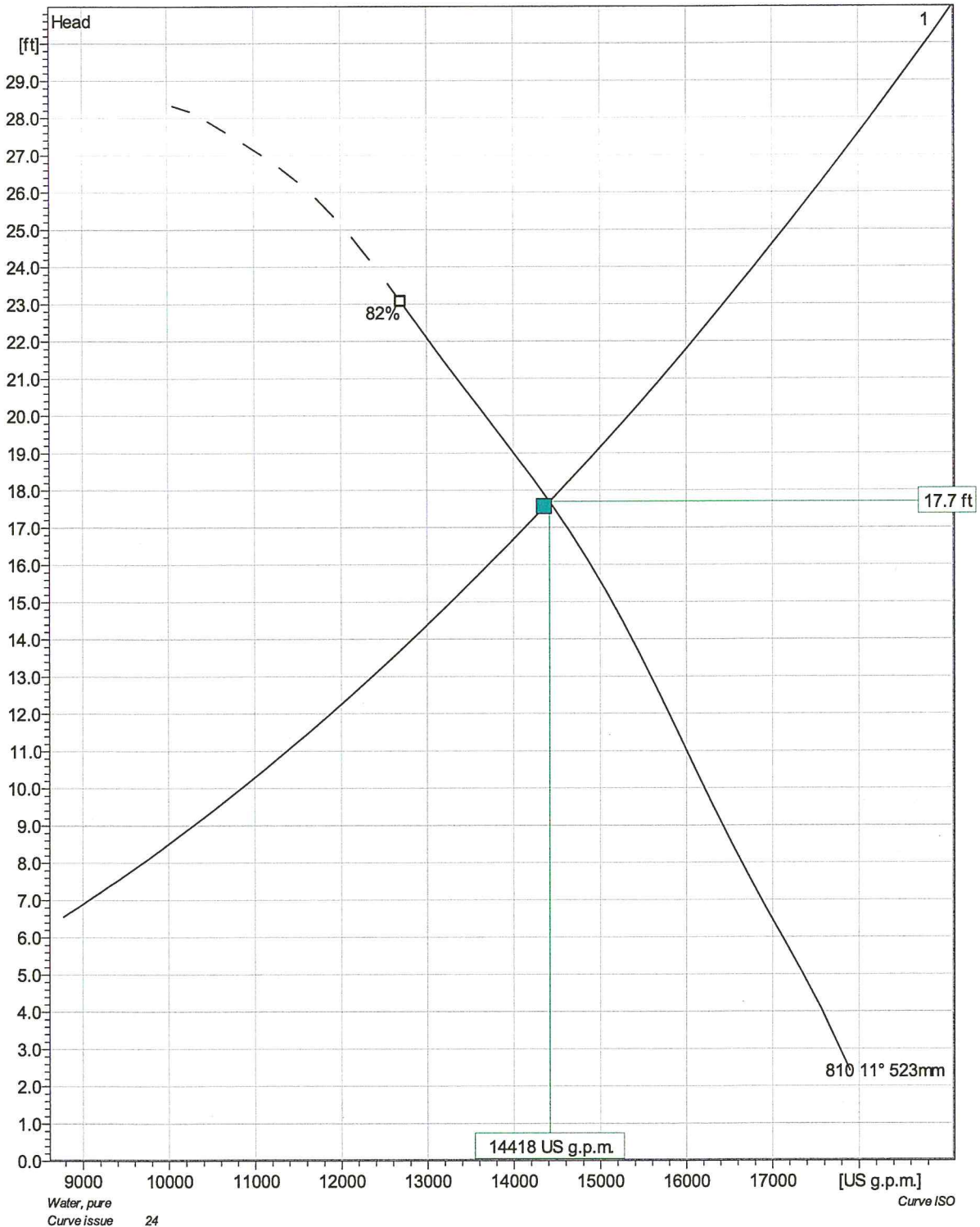
Pumps running /System	Frequency	Flow	Head	Shaft power	Flow	Head	Shaft power	Hyd eff.	Specific energy	NPSHre
1	60 Hz	14400 US g.p.m.	17.7 ft	80.1 hp	14400 US g.p.m.	17.7 ft	80.1 hp	80.5 %	75.9 kWh/US MG	18.5 ft
1	55.1 Hz	13200 US g.p.m.	14.9 ft	62 hp	13200 US g.p.m.	14.9 ft	62 hp	80.5 %	63.8 kWh/US MG	16.1 ft
1	50.1 Hz	12000 US g.p.m.	12.3 ft	46.5 hp	12000 US g.p.m.	12.3 ft	46.5 hp	80.5 %	53.3 kWh/US MG	13.8 ft
1	45.1 Hz	10800 US g.p.m.	9.98 ft	33.9 hp	10800 US g.p.m.	9.98 ft	33.9 hp	80.5 %	43.9 kWh/US MG	11.7 ft
1	40.1 Hz									

PL 7065/705 3~ 810 VFD Curve



Project	Project ID	Created by	Created on 2017-01-19	Last update
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PL 7065/705 3~ 810 Duty Analysis



Pumps running /System	Individual pump			Total			Pump eff.	Specific energy	NPSHre
	Flow	Head	Shaft power	Flow	Head	Shaft power			
1	14400 US g.p.m.	17.7 ft	80.1 hp	14400 US g.p.m.	17.7 ft	80.1 hp	80.5 %	75.9 kWh/US MG	18.5 ft

Project	Project ID	Created by	Created on	Last update
			2017-01-19	

PL 7065/705 3~ 810

Performance curve



Pump

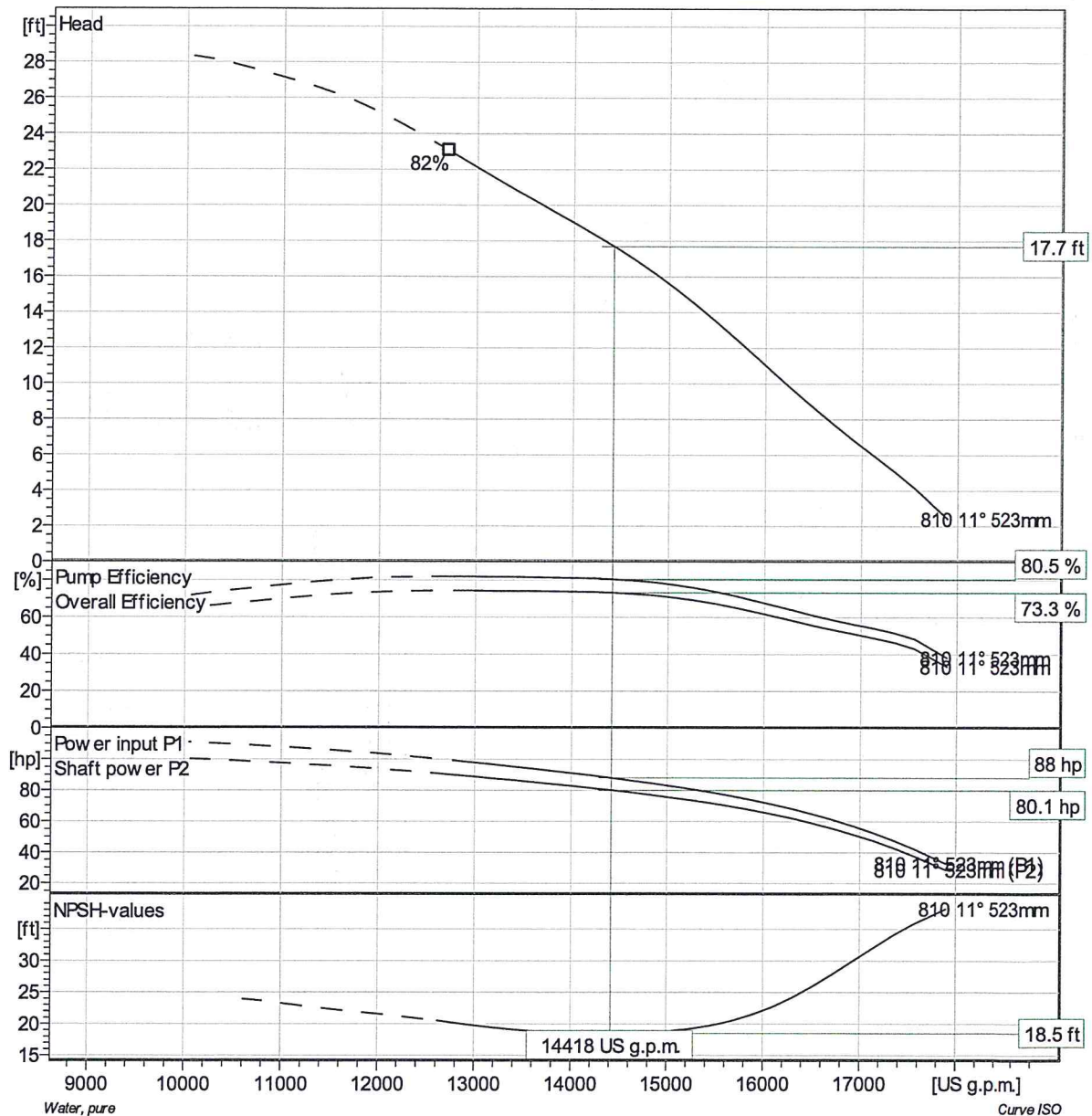
Column diameter 31 1/2 inch
Inlet diameter 20 9/16"
Impeller diameter 4
Number of blades 4

Motor

Motor # P0705.000 43-30-8FA-W 90hp
Approval Standard
Stator variant 1
Frequency 60 Hz
Rated voltage 460 V
Number of poles 8
Phases 3~
Rated power 90 hp
Rated current 112 A
Starting current 515 A
Rated speed 885 rpm

Power factor
1/1 Load 0.83
3/4 Load 0.80
1/2 Load 0.73

Motor efficiency
1/1 Load 90.5 %
3/4 Load 91.0 %
1/2 Load 90.0 %

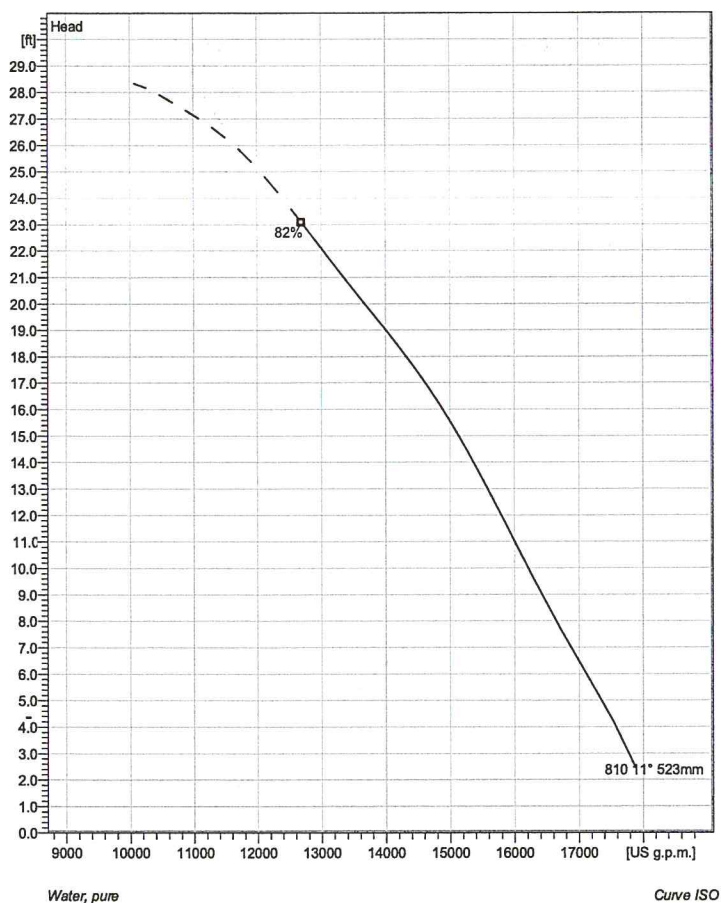


Duty point
Flow 14400 US g.p.m.
Head 17.5 ft
Guarantee
ISO_9906_Grade No

Project	Project ID	Created by	Created on	Last update
			2017-01-19	

PL 7065/705 3~ 810

Technical specification



Note: Picture might not correspond to the current configuration.

General

Axial flow propeller pumps with fixed or adjustable pitch blades for high capacity low head pumping of clean or slightly contaminated liquids. Cast iron design optimized for high-flow efficiency.

Impeller

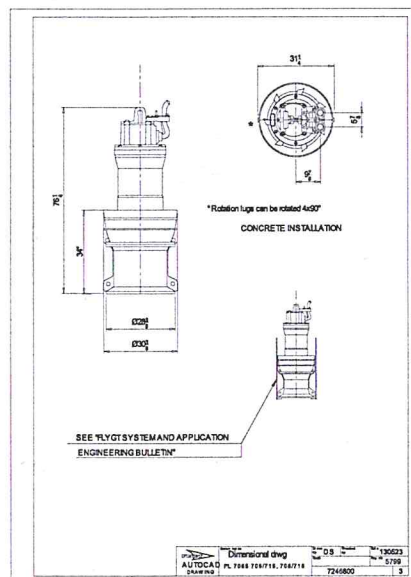
Impeller material	Stainless steel
Column diameter	31 1/2 inch
Inlet diameter	
Impeller diameter	523 mm
Number of blades	4

Motor

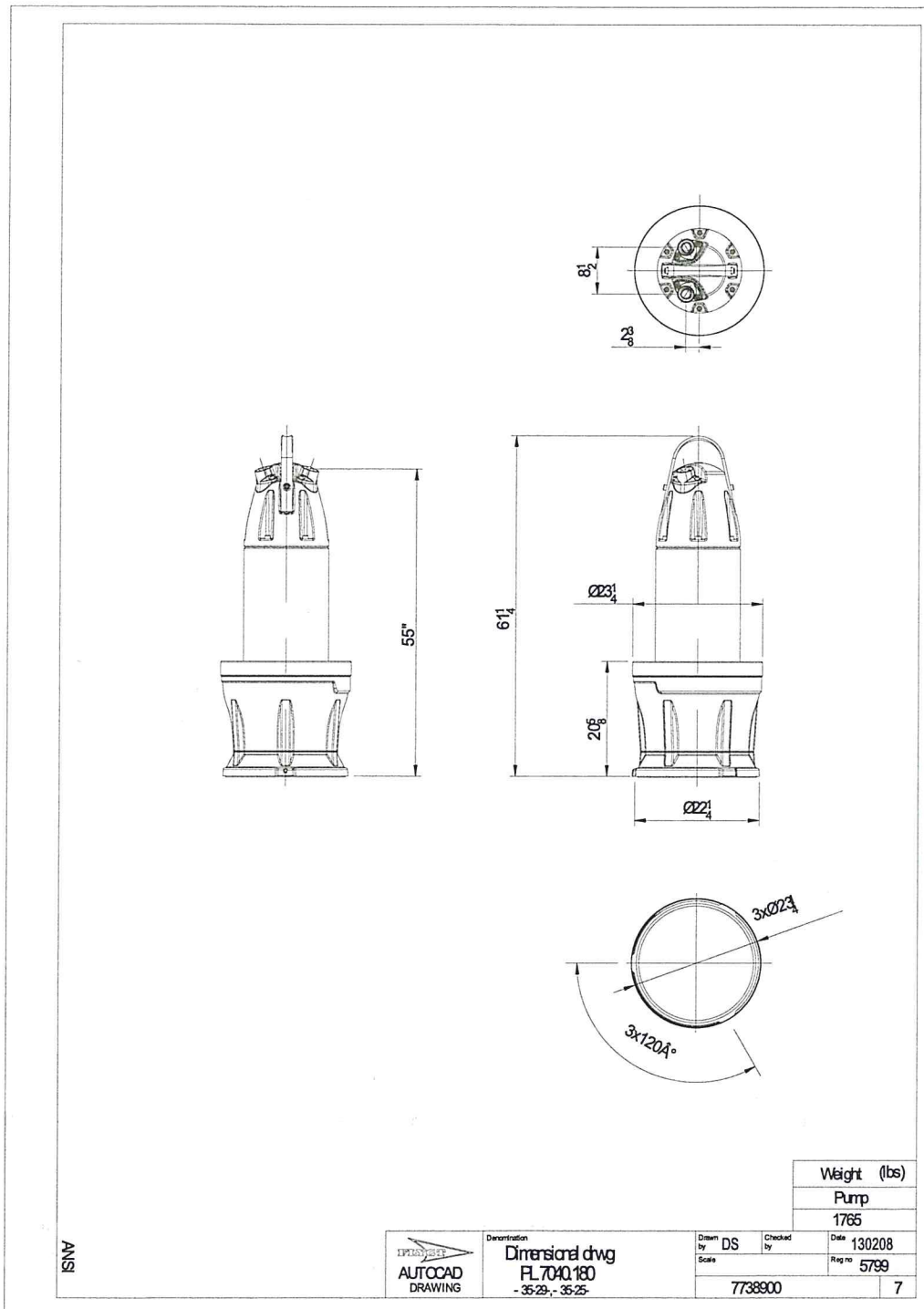
Motor #	P0705.000 43-30-8FA-W 90hp
Approval	Standard
Stator variant	1
Frequency	60 Hz
Rated voltage	460 V
Number of poles	8
Phases	3~
Rated power	90 hp
Rated current	112 A
Starting current	515 A
Rated speed	885 rpm
Power factor	
1/1 Load	0.83
3/4 Load	0.80
1/2 Load	0.73
Motor efficiency	
1/1 Load	90.5 %
3/4 Load	91.0 %
1/2 Load	90.0 %

Configuration

Installation: L - Column pipe Semi permanent, Wet



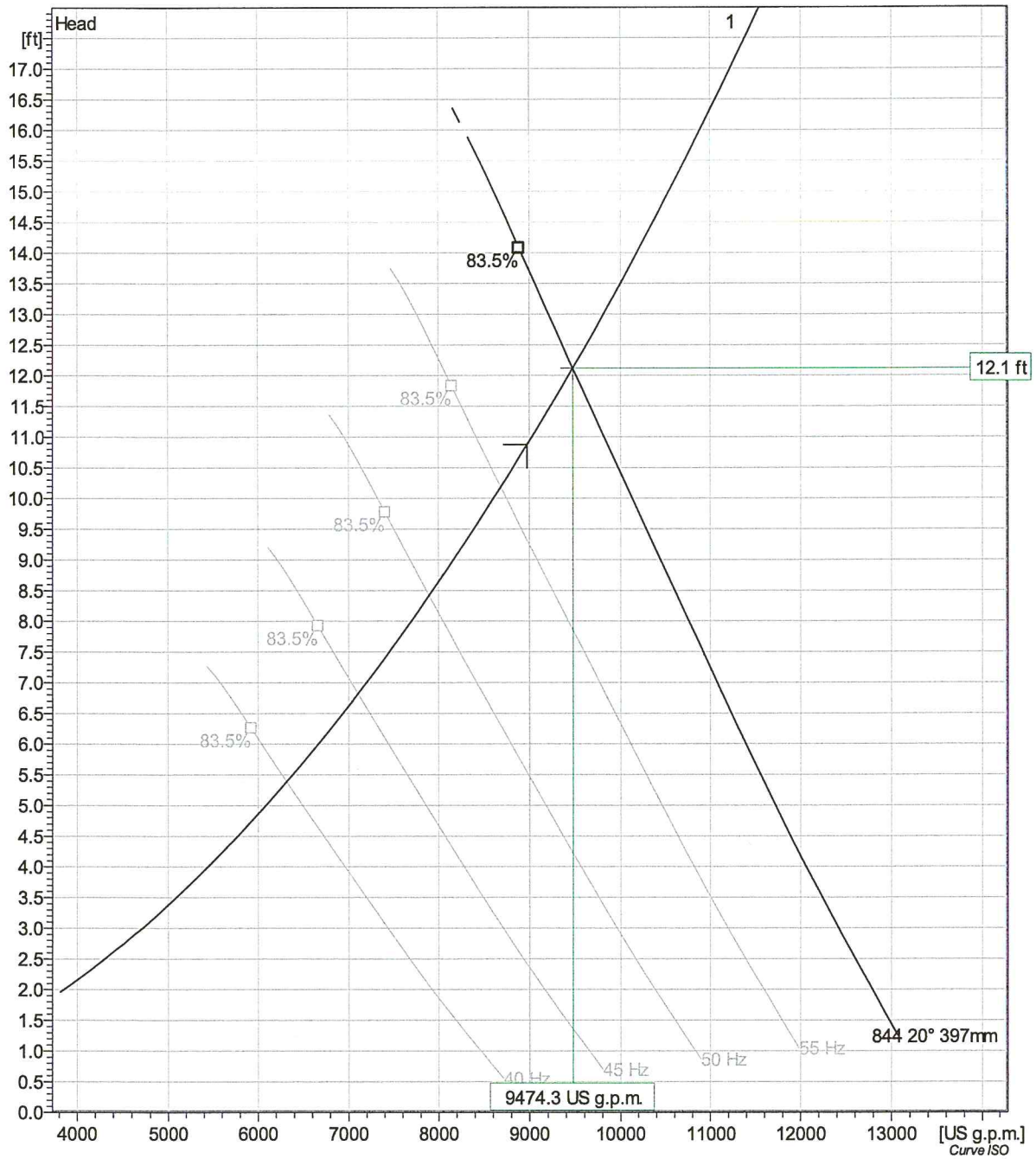
PL 7040 ** 3~ 844
Dimensional drawing



Project	Project ID	Created by	Created on 2017-01-19	Last update
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PL 7040 ** 3~ 844

VFD Analysis



Pumps running /System	Frequency	Flow	Head	Shaft power	Flow	Head	Shaft power	Hyd. eff.	Specific energy	NPSHre
1	60 Hz	9470 US g.p.m.	12.1 ft	35.2 hp	9470 US g.p.m.	12.1 ft	35.2 hp	82.5 %	50.7 kWh/US MG	18.5 ft
1	55 Hz	8680 US g.p.m.	10.2 ft	27.1 hp	8680 US g.p.m.	10.2 ft	27.1 hp	82.5 %	42.3 kWh/US MG	16.1 ft
1	50 Hz									
1	45 Hz									
1	40 Hz									

Project

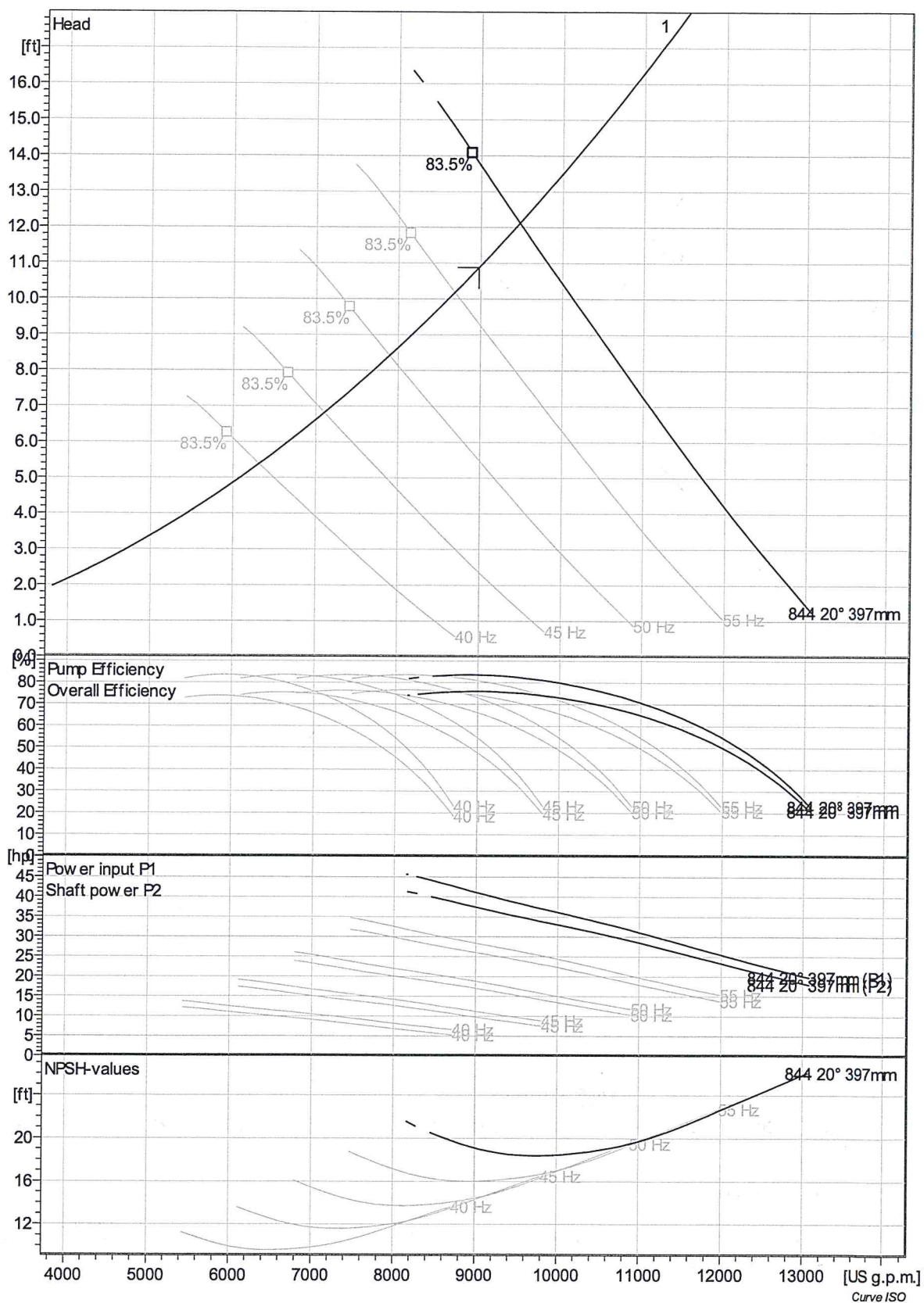
Project ID

Created by

Created on
2017-01-19

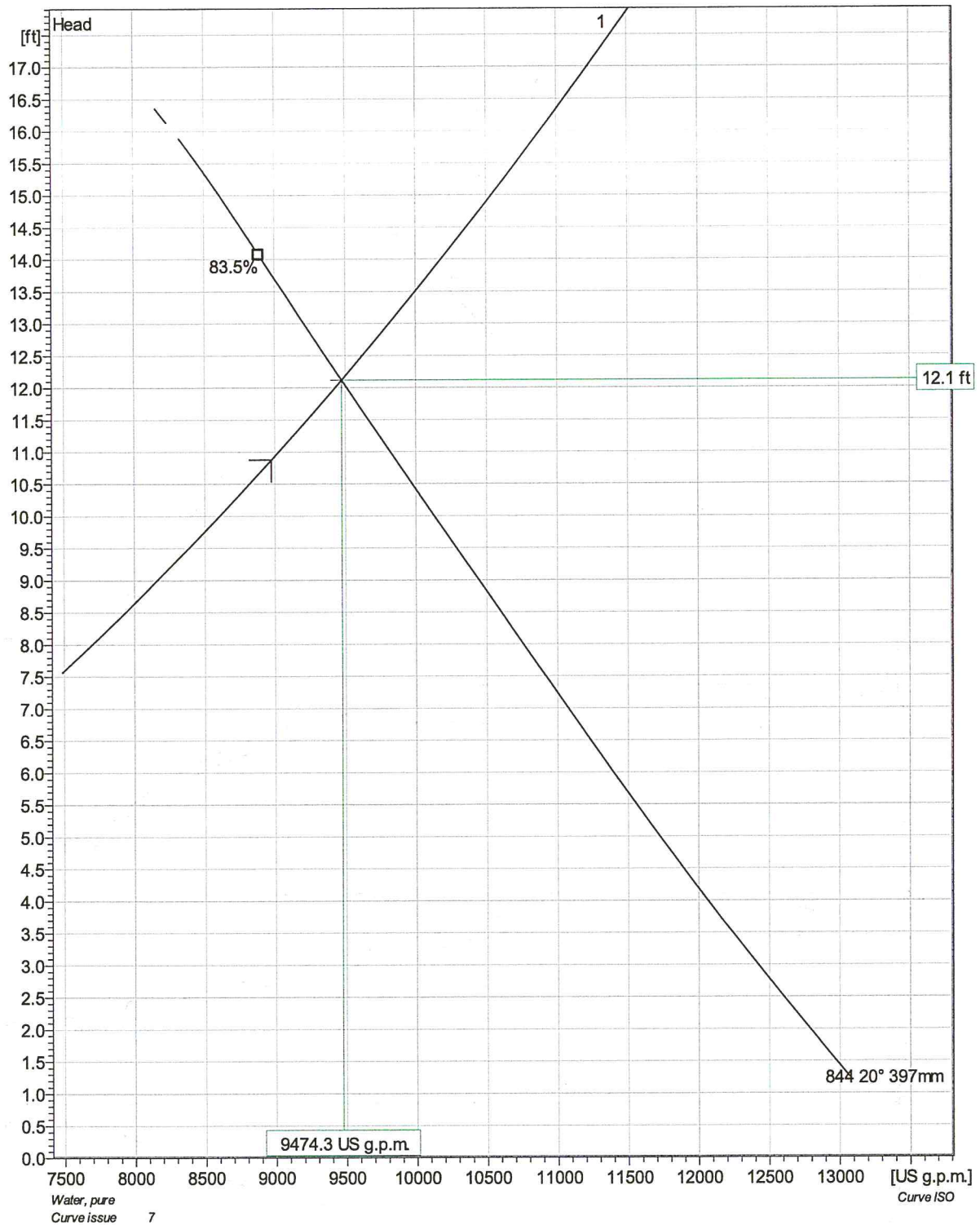
Last update

PL 7040 ** 3~ 844 VFD Curve



Project	Project ID	Created by	Created on 2017-01-19	Last update
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PL 7040 ** 3~ 844 Duty Analysis



Pumps running /System	Individual pump			Total					NPSHre
	Flow	Head	Shaft power	Flow	Head	Shaft power	Pump eff.	Specific energy	
1	9470 US g.p.m.	12.1 ft	35.2 hp	9470 US g.p.m.	12.1 ft	35.2 hp	82.5 %	50.7 kWh/US MG	18.5 ft

Project	Project ID	Created by	Created on	Last update
			2017-01-19	

PL 7040 ** 3~ 844

Performance curve



Pump

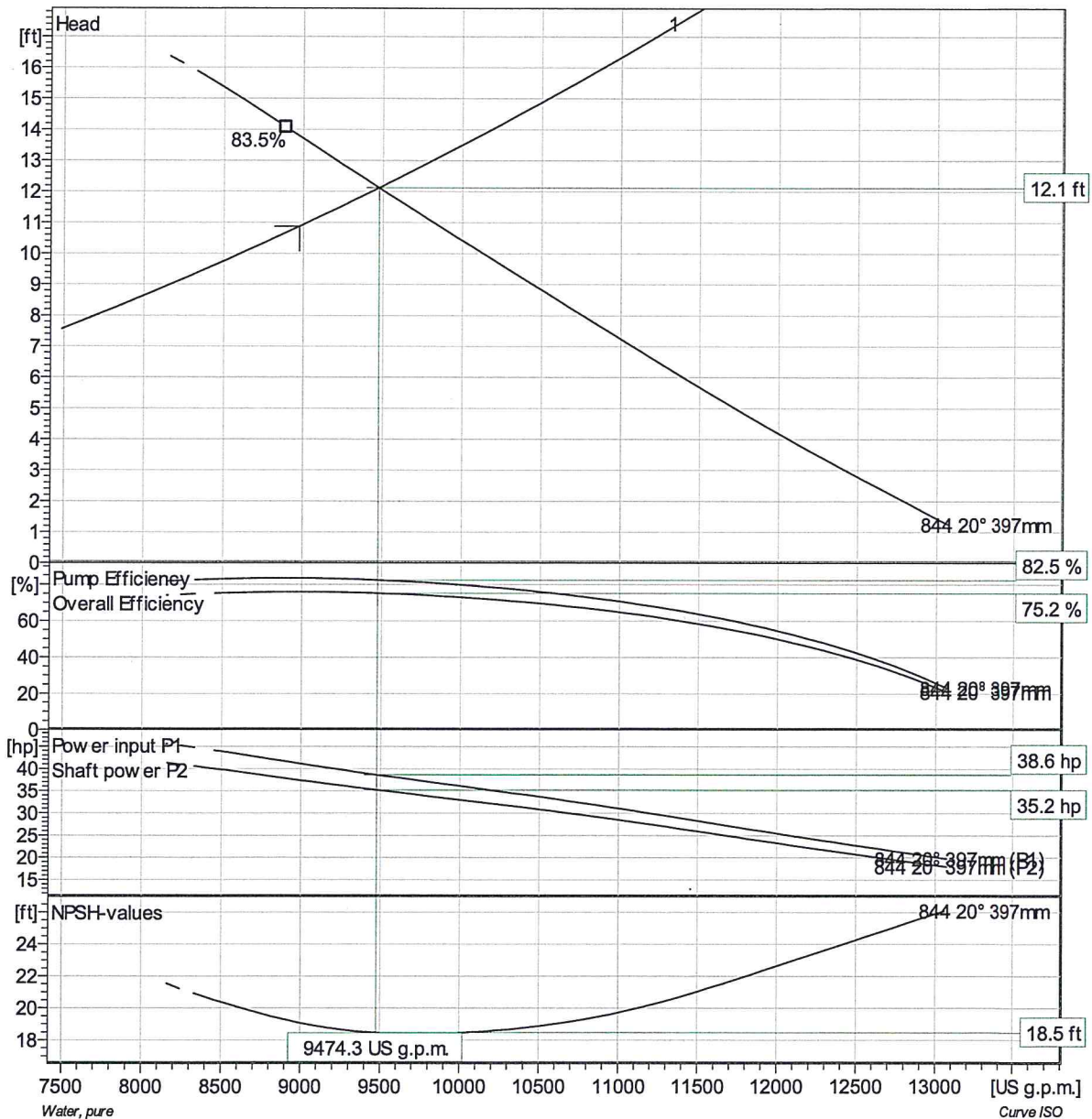
Column diameter 23 5/8 inch
Inlet diameter
Impeller diameter 15 5/8"
Number of blades 3

Motor

Motor # P7040.180 35-29-8FA-W 40hp
Approval Standard
Stator variant 1
Frequency 60 Hz
Rated voltage 460 V
Number of poles 8
Phases 3~
Rated power 40 hp
Rated current 50 A
Starting current 271 A
Rated speed 885 rpm

Power factor
1/1 Load 0.82
3/4 Load 0.79
1/2 Load 0.70

Motor efficiency
1/1 Load 90.7 %
3/4 Load 91.5 %
1/2 Load 91.2 %

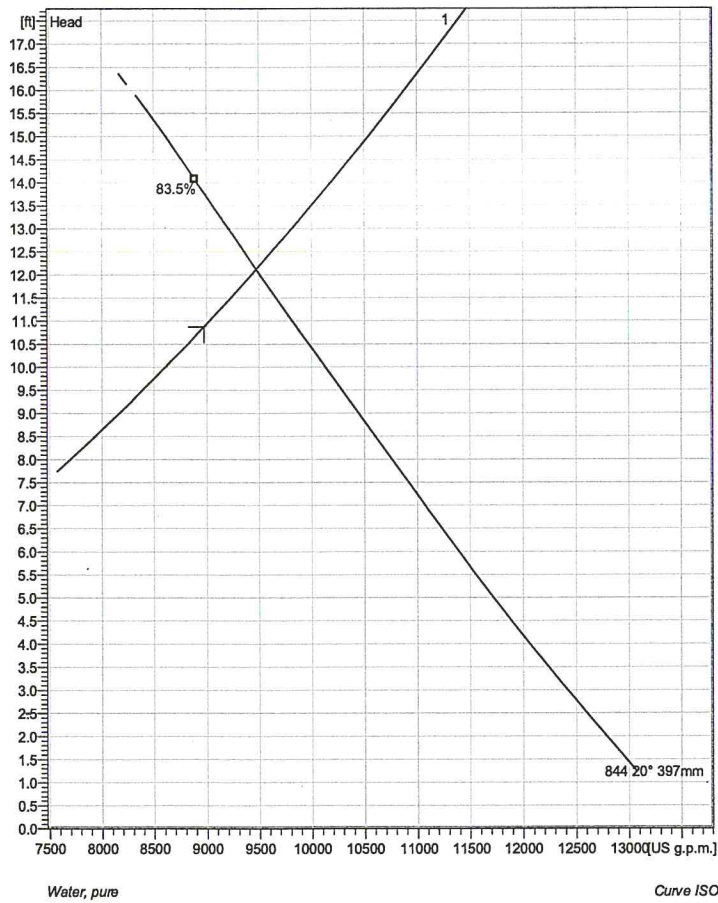


Duty point
Flow 8980 US g.p.m. Head 10.9 ft
Guarantee
ISO_9906_Grade No

Project	Project ID	Created by	Created on	Last update
			2017-01-19	

PL 7040 ** 3~ 844

Technical specification



Note: Picture might not correspond to the current configuration.

General

Axial flow propeller pumps with fixed or adjustable pitch blades for high capacity low head pumping of clean or slightly contaminated liquids. Cast iron design optimized for high-flow efficiency.

Impeller

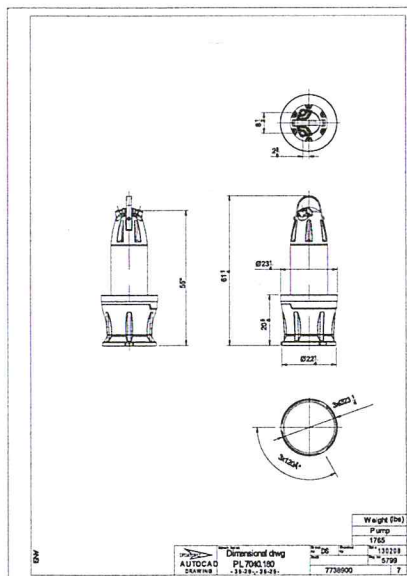
Impeller material	Stainless steel
Column diameter	23 5/8 inch
Inlet diameter	
Impeller diameter	397 mm
Number of blades	3

Motor

Motor #	P7040.180 35-29-8FA-W 40hp
Approval	Standard
Stator variant	1
Frequency	60 Hz
Rated voltage	460 V
Number of poles	8
Phases	3~
Rated power	40 hp
Rated current	50 A
Starting current	271 A
Rated speed	885 rpm
Power factor	
1/1 Load	0.82
3/4 Load	0.79
1/2 Load	0.70
Motor efficiency	
1/1 Load	90.7 %
3/4 Load	91.5 %
1/2 Load	91.2 %

Configuration

Installation: L - Column pipe Semi permanent, Wet



Project

Project ID

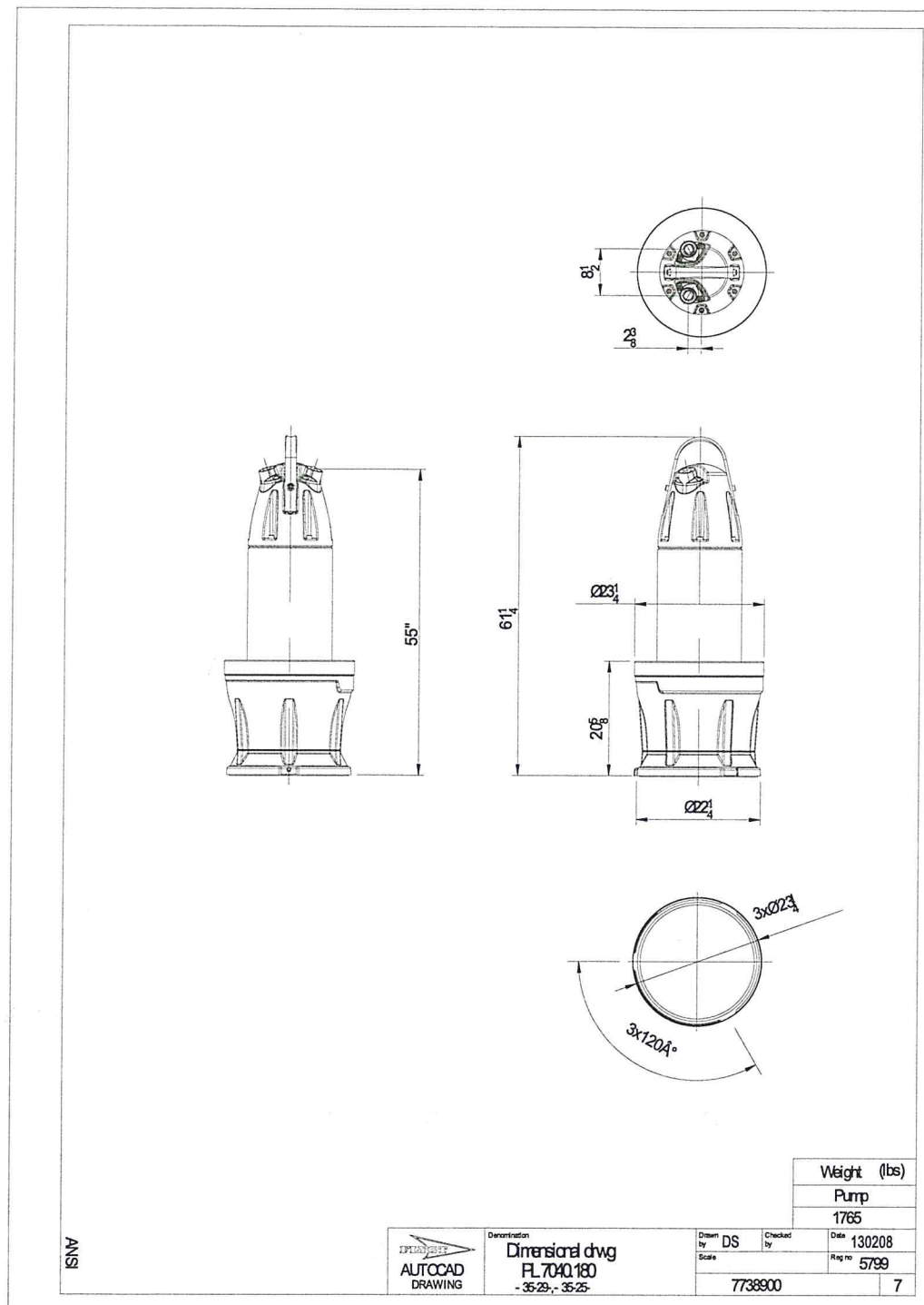
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Created on
2017-01-19

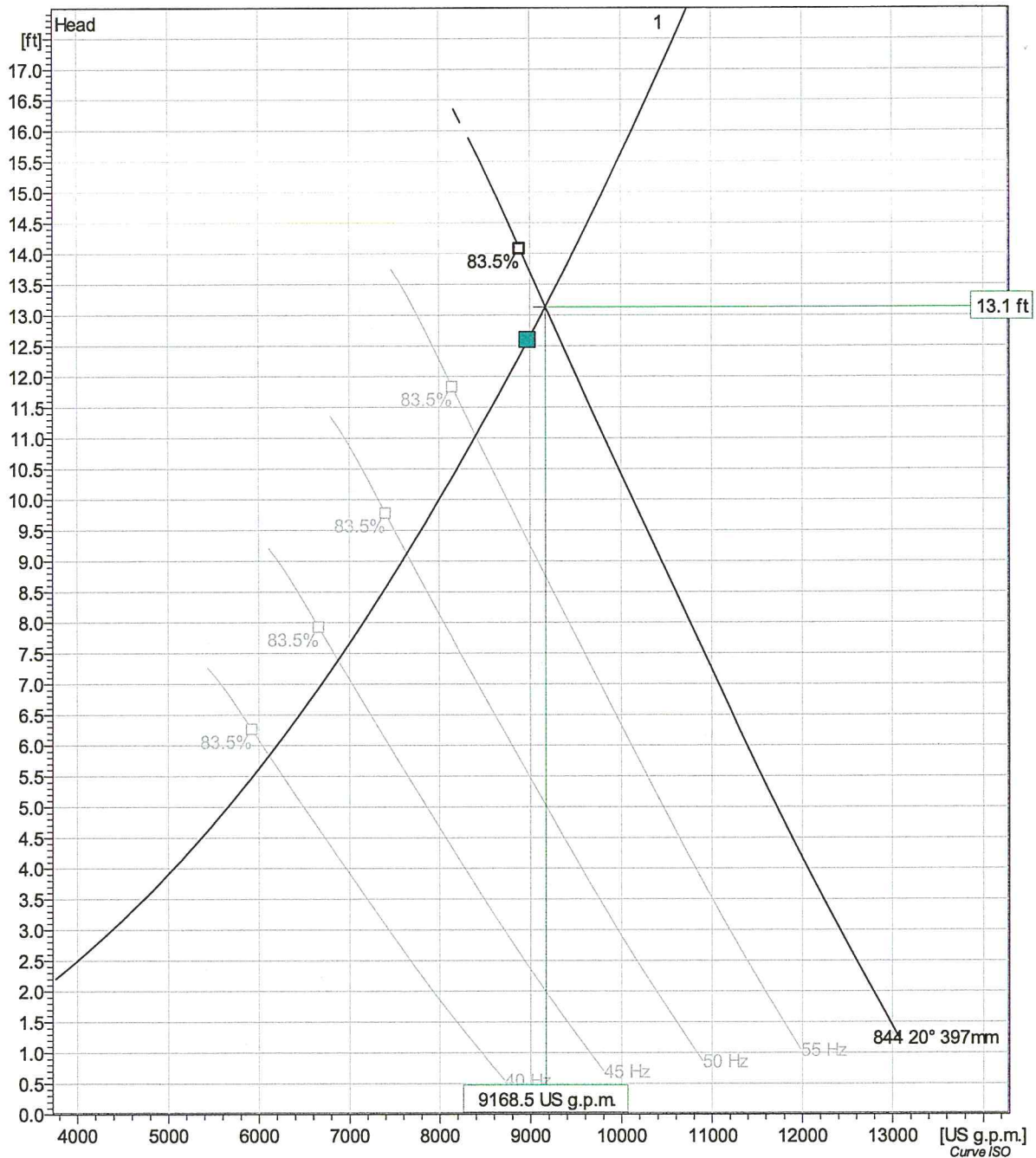
Last update

PL 7040 ** 3~ 844

Dimensional drawing

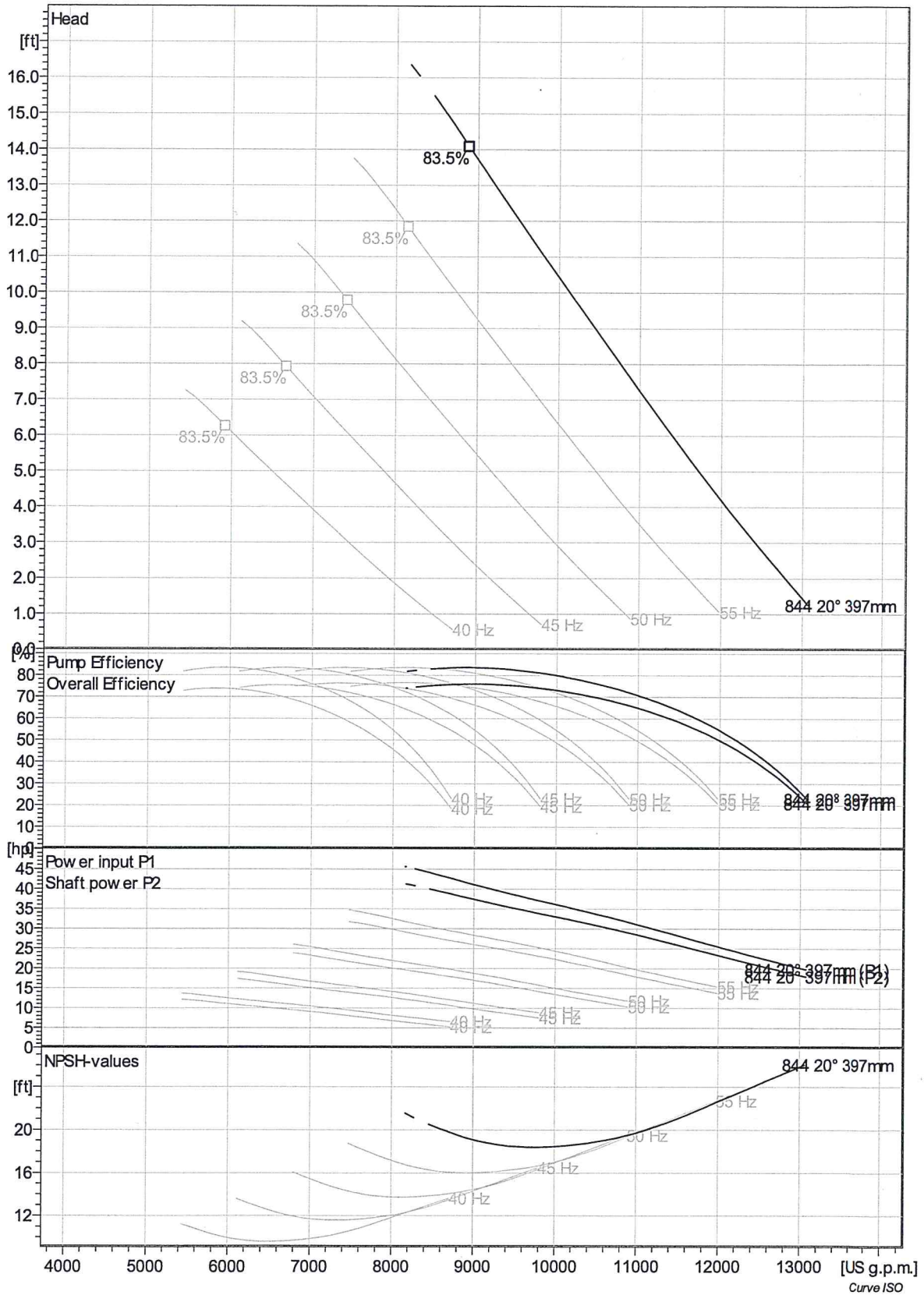


PL 7040 ** 3~ 844 VFD Analysis



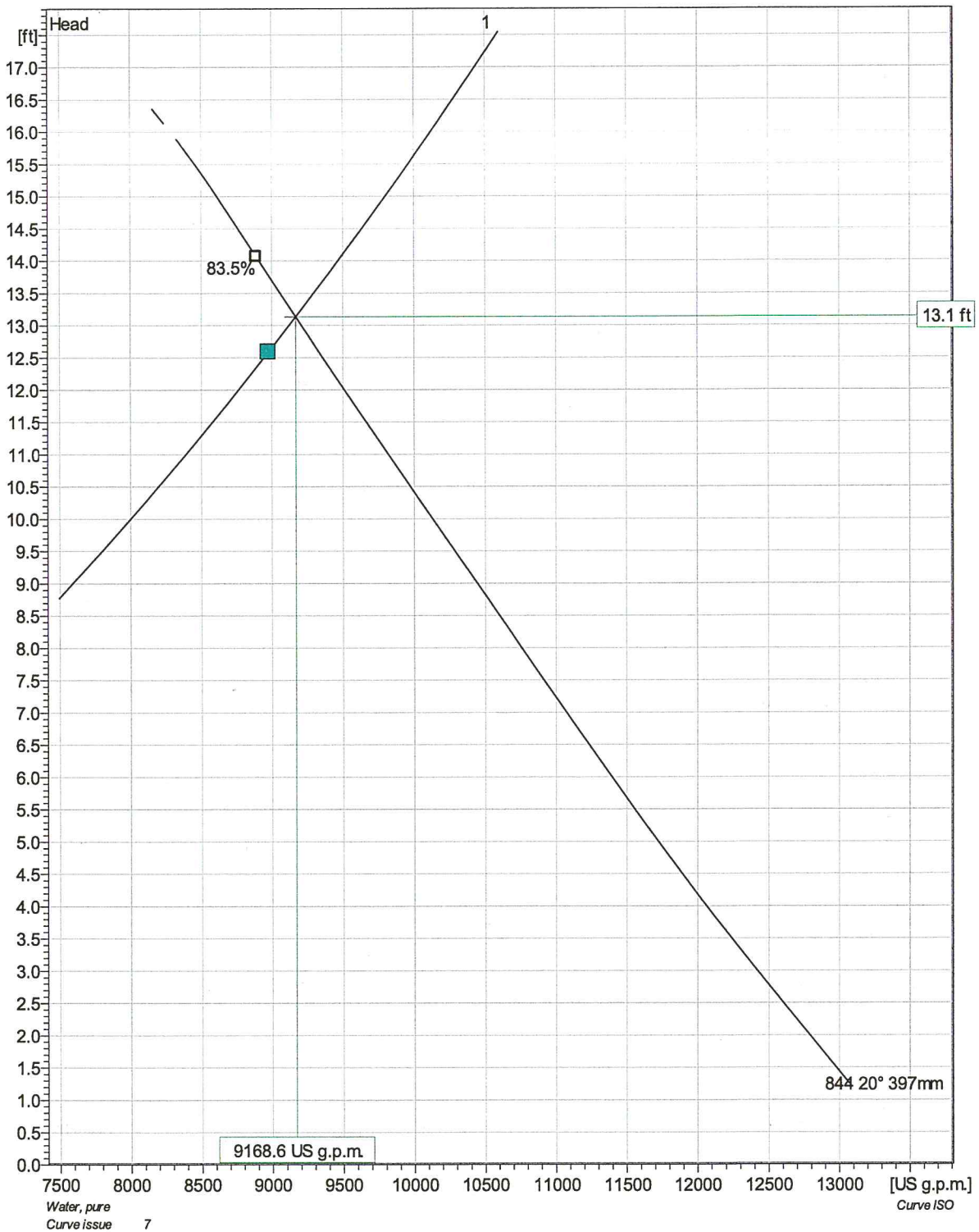
Pumps running /System	Frequency	Flow	Head	Shaft power	Flow	Head	Shaft power	Hyd. eff.	Specific energy	NPSH _{re}
1	60 Hz	9170 US g.p.m.	13.1 ft	36.6 hp	9170 US g.p.m.	13.1 ft	36.6 hp	83.3 %	54.5 kWh/US MG	18.8 ft
1	55 Hz	8400 US g.p.m.	11 ft	28.2 hp	8400 US g.p.m.	11 ft	28.2 hp	83.3 %	45.4 kWh/US MG	16.3 ft
1	50 Hz									
1	45 Hz									
1	40 Hz									

PL 7040 ** 3~ 844 VFD Curve



Project	Project ID	Created by	Created on 2017-01-19	Last update
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PL 7040 ** 3~ 844 Duty Analysis



Pumps running /System	Individual pump			Total					NPSH _{re}
	Flow	Head	Shaft power	Flow	Head	Shaft power	Pump eff.	Specific energy	
1	9170 US g.p.m.	13.1 ft	36.6 hp	9170 US g.p.m.	13.1 ft	36.6 hp	83.3 %	54.5 kWh/US MG	18.8 ft

Project	Project ID	Created by	Created on	Last update
			2017-01-19	

PL 7040 ** 3~ 844

Performance curve



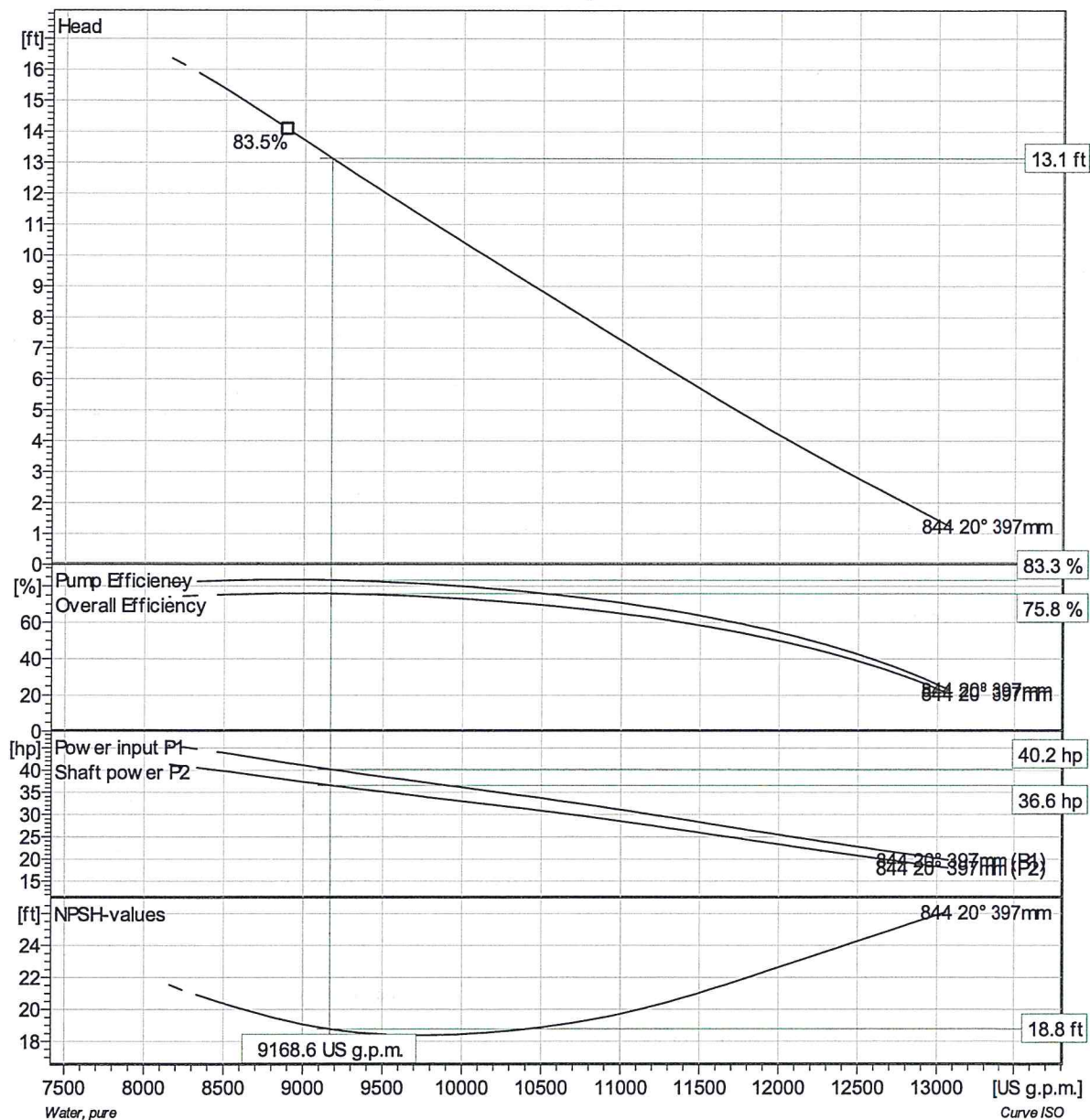
Pump

Column diameter 23 5/8 inch
Inlet diameter 15 5/8"
Impeller diameter 3
Number of blades 3

Motor

Motor # P7040.180 35-29-8FA-W 40hp
Approval Standard
Stator variant 1
Frequency 60 Hz
Rated voltage 460 V
Number of poles 8
Phases 3~
Rated power 40 hp
Rated current 50 A
Starting current 271 A
Rated speed 885 rpm

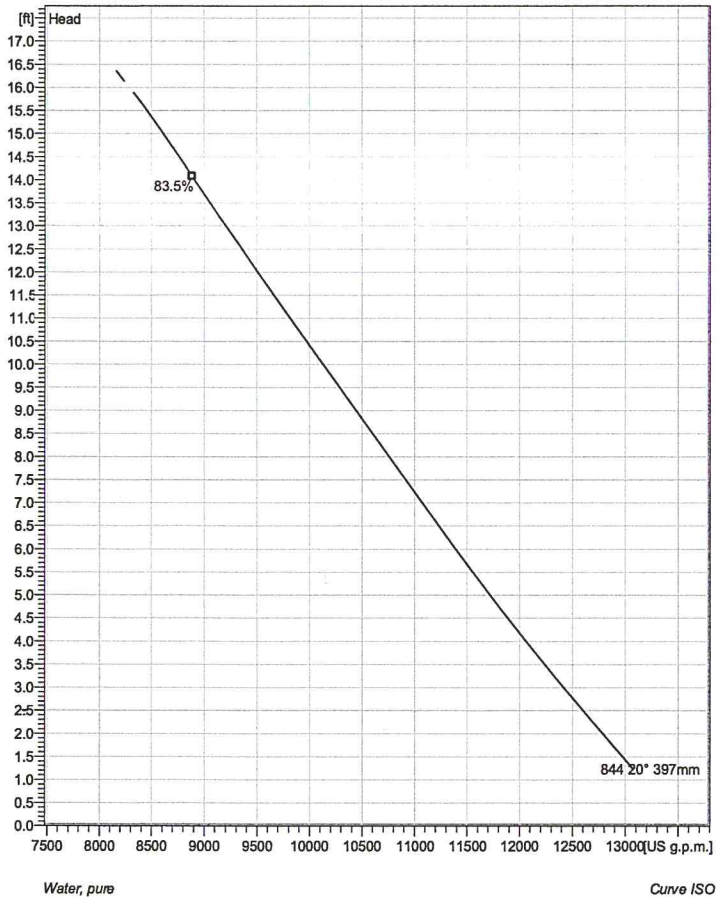
Power factor
1/1 Load 0.82
3/4 Load 0.79
1/2 Load 0.70
Motor efficiency
1/1 Load 90.7 %
3/4 Load 91.5 %
1/2 Load 91.2 %



Duty point
Flow 8980 US g.p.m.
Head 12.6 ft
Guarantee
ISO_9906_Grade
No

PL 7040 ** 3~ 844

Technical specification



Note: Picture might not correspond to the current configuration.

General

Axial flow propeller pumps with fixed or adjustable pitch blades for high capacity low head pumping of clean or slightly contaminated liquids. Cast iron design optimized for high-flow efficiency.

Impeller

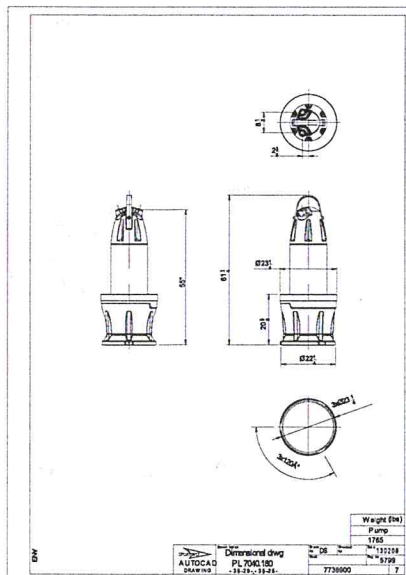
Impeller material	Stainless steel
Column diameter	23 5/8 inch
Inlet diameter	
Impeller diameter	397 mm
Number of blades	3

Motor

Motor #	P7040.180 35-29-8FA-W 40hp
Approval	Standard
Stator variant	1
Frequency	60 Hz
Rated voltage	460 V
Number of poles	8
Phases	3~
Rated power	40 hp
Rated current	50 A
Starting current	271 A
Rated speed	885 rpm
Power factor	
1/1 Load	0.82
3/4 Load	0.79
1/2 Load	0.70
Motor efficiency	
1/1 Load	90.7 %
3/4 Load	91.5 %
1/2 Load	91.2 %

Configuration

Installation: L - Column pipe Semi permanent, Wet



Project

Project ID

Created by

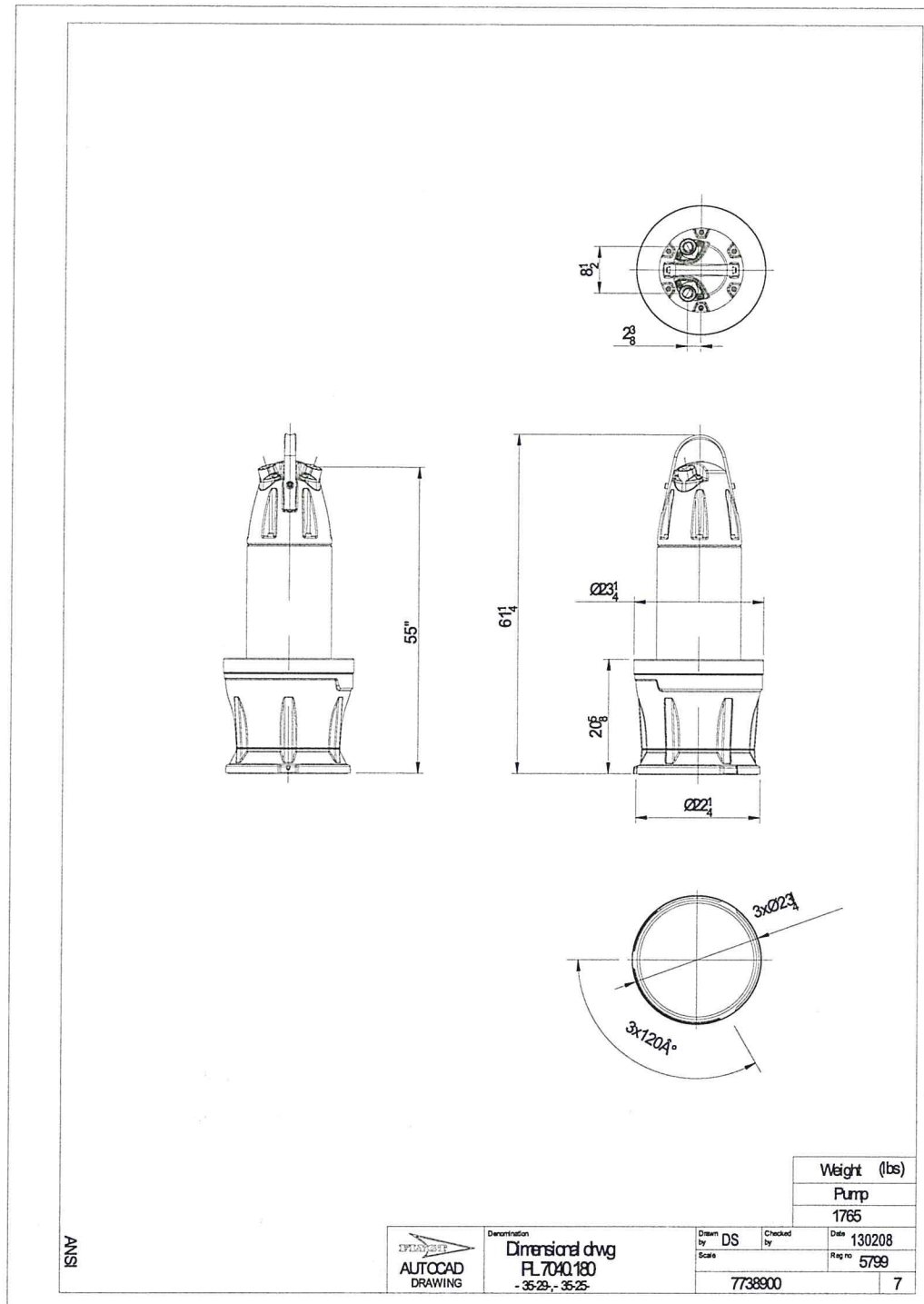
Created on

Last update

2017-01-19

PL 7040 ** 3~ 842

Dimensional drawing



Project

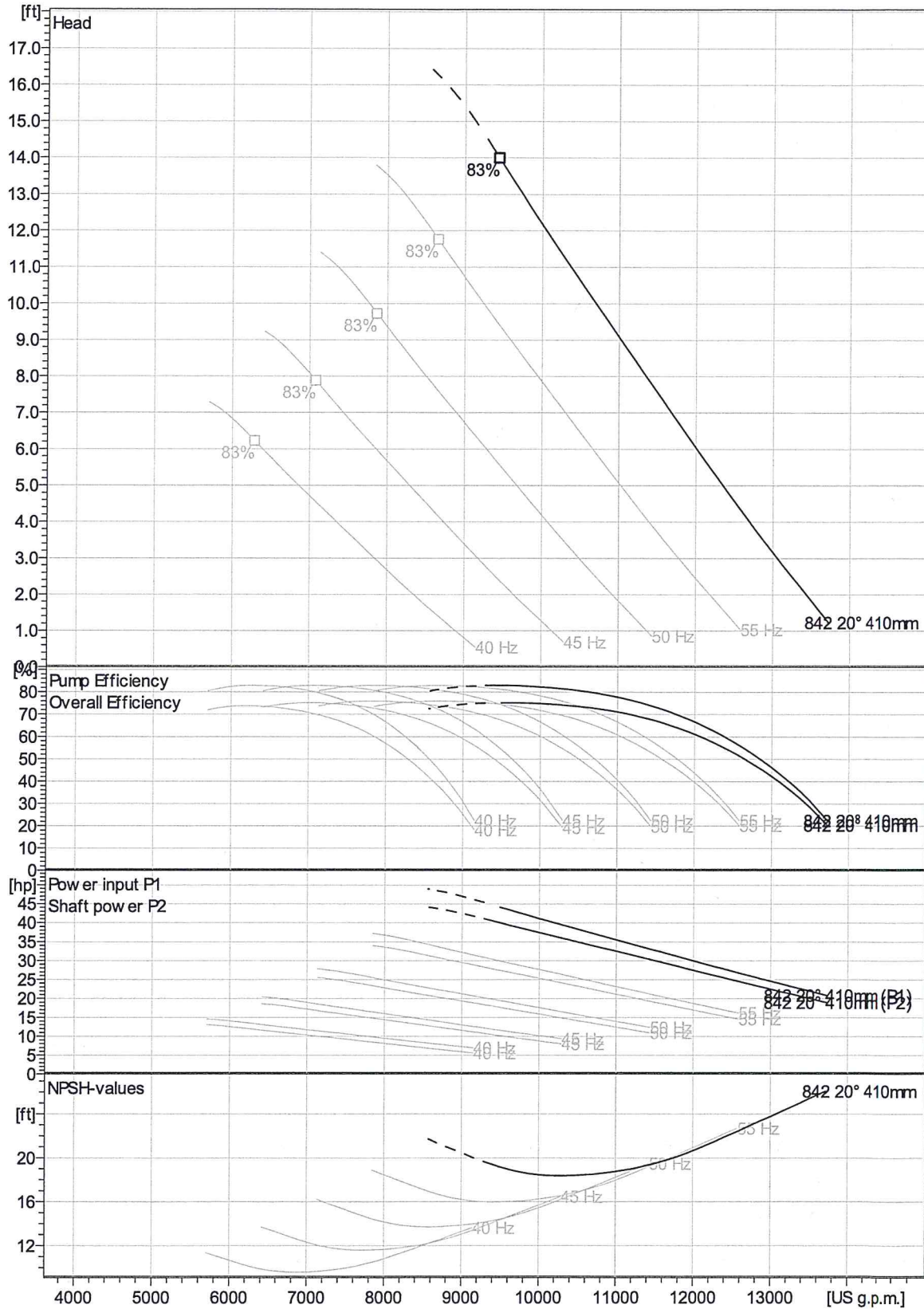
Project ID

Created by

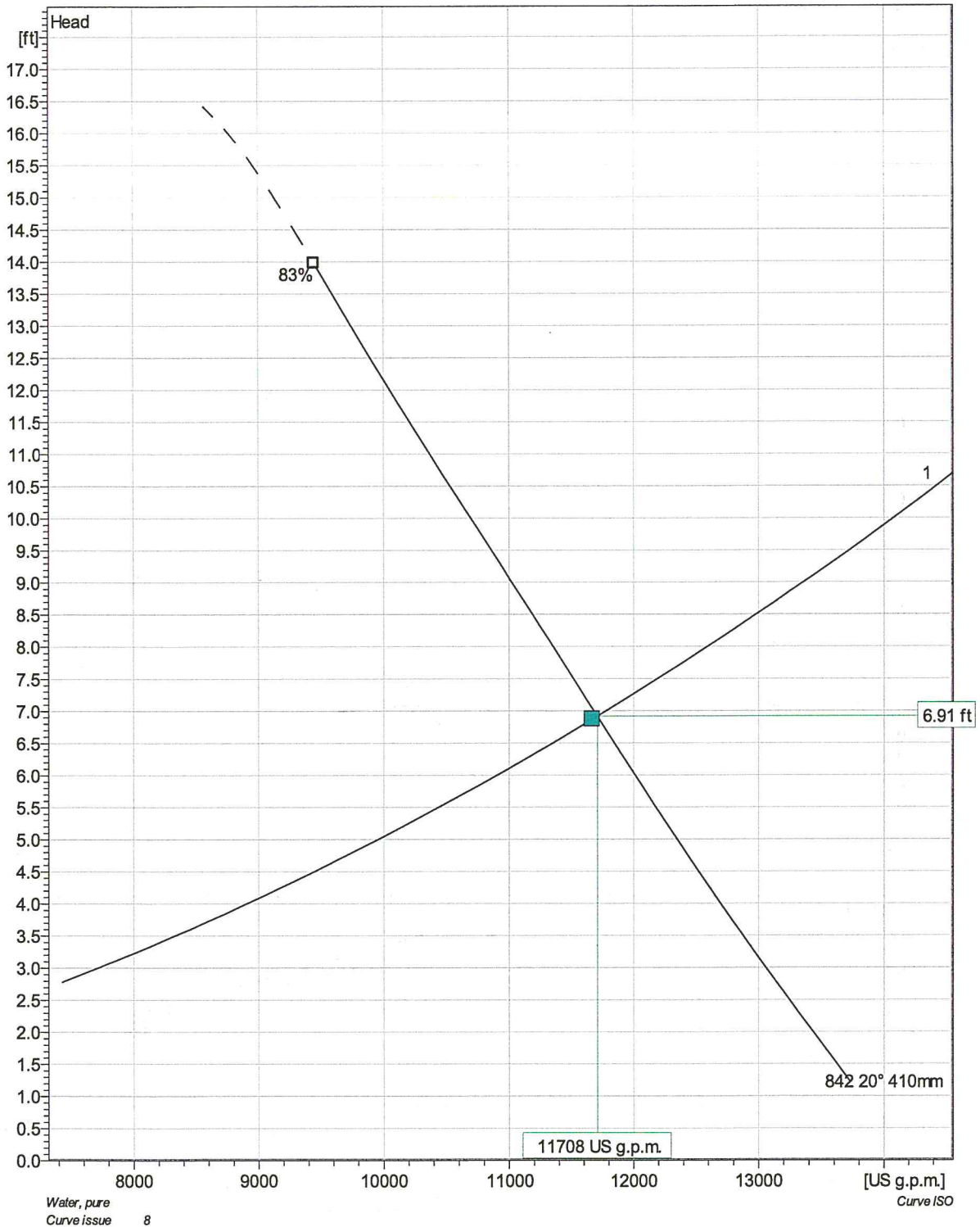
Created on
2017-01-19

Last update

PL 7040 ** 3~ 842 VFD Curve



PL 7040 ** 3~ 842 Duty Analysis



Pumps running /System	Individual pump			Total					
	Flow	Head	Shaft power	Flow	Head	Shaft power	Pump eff.	Specific energy	NPSHre
1	11700 US g.p.m.	6.91 ft	29 hp	11700 US g.p.m.	6.91 ft	29 hp	70.7 %	33.5 kWh/US MG	19.9 ft

Project	Project ID	Created by	Created on	Last update
			2017-01-19	

PL 7040 ** 3~ 842

Performance curve



Pump

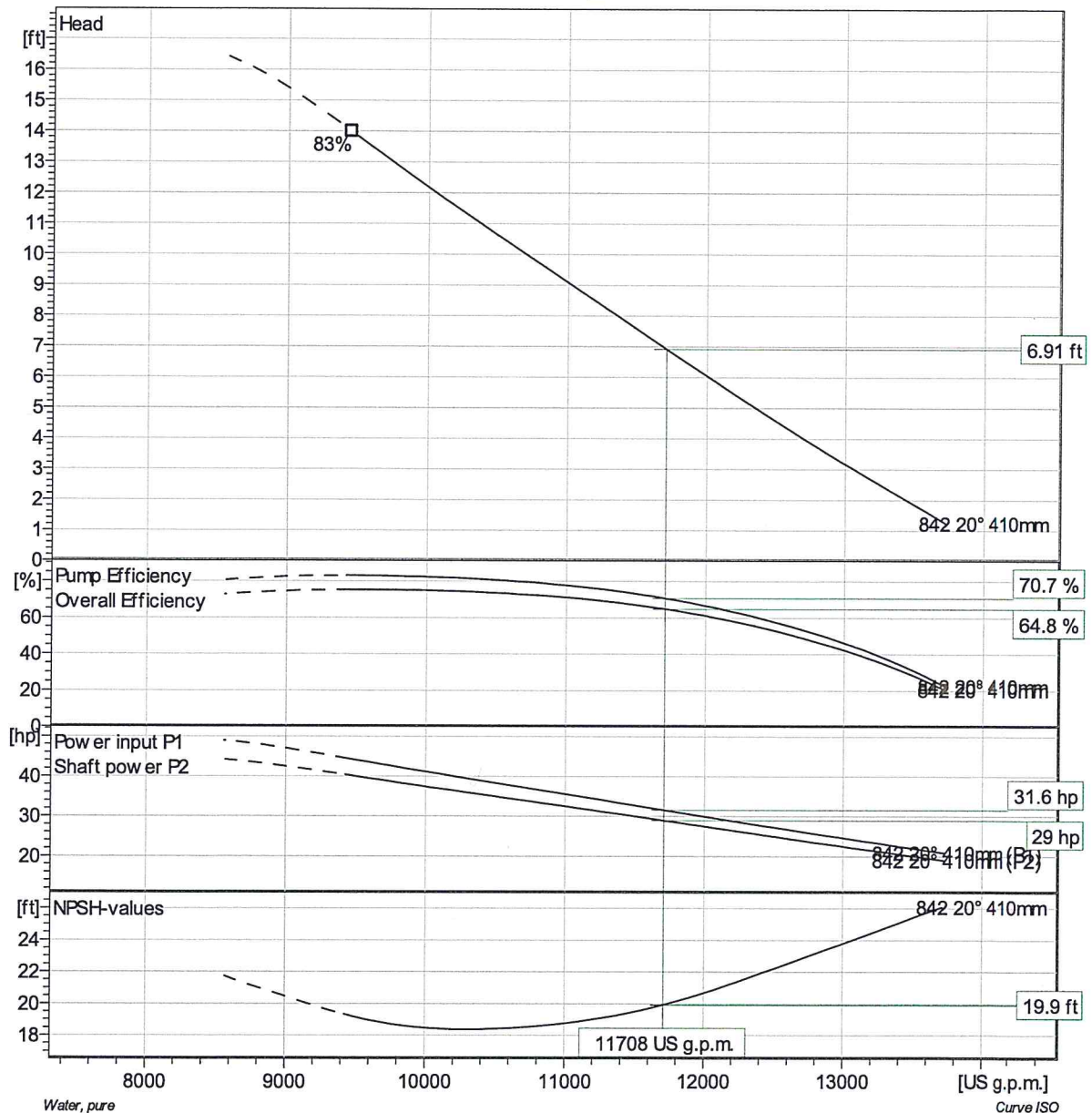
Column diameter 23 5/8 inch
Inlet diameter
Impeller diameter 16 1/8"
Number of blades 3

Motor

Motor # P7040.180 35-29-8FA-W 40hp
Approval Standard
Stator variant 1
Frequency 60 Hz
Rated voltage 460 V
Number of poles 8
Phases 3~
Rated power 40 hp
Rated current 50 A
Starting current 271 A
Rated speed 885 rpm

Power factor
1/1 Load 0.82
3/4 Load 0.79
1/2 Load 0.70

Motor efficiency
1/1 Load 90.7 %
3/4 Load 91.5 %
1/2 Load 91.2 %

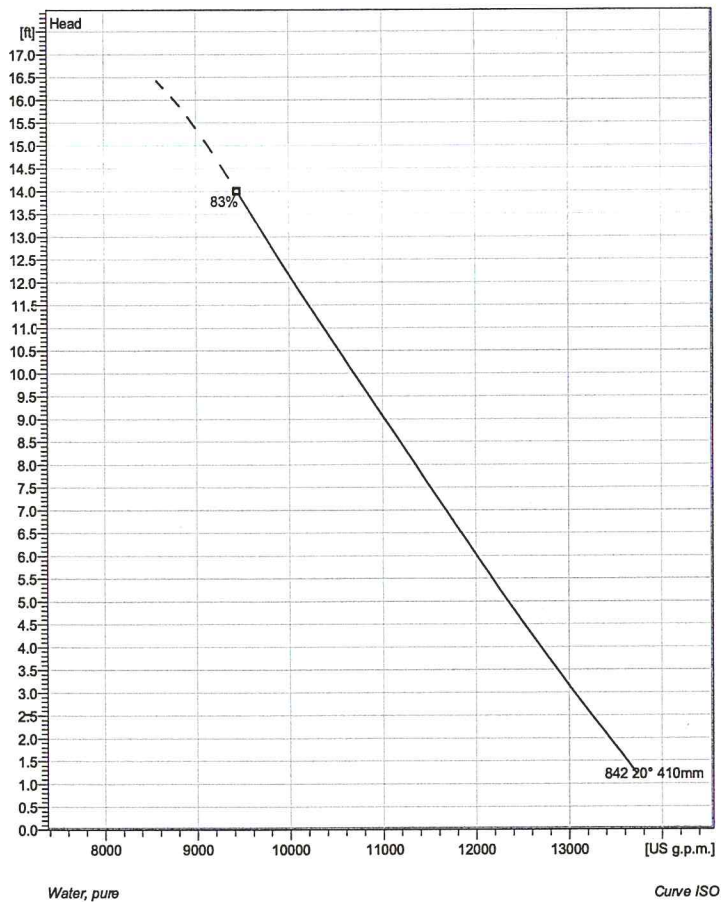


Duty point
Flow 11700 US g.p.m. Head 6.87 ft
Guarantee
ISO_9906_Grade No

Project	Project ID	Created by	Created on	Last update
			2017-01-19	

PL 7040 ** 3~ 842

Technical specification



Note: Picture might not correspond to the current configuration.

General

Axial flow propeller pumps with fixed or adjustable pitch blades for high capacity low head pumping of clean or slightly contaminated liquids. Cast iron design optimized for high-flow efficiency.

Impeller

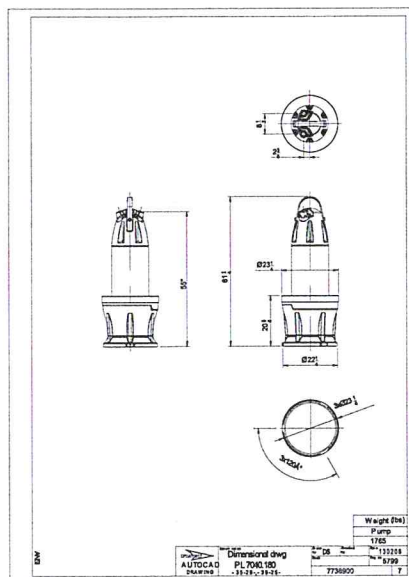
Impeller material	Stainless steel
Column diameter	23 5/8 inch
Inlet diameter	
Impeller diameter	410 mm
Number of blades	3

Motor

Motor #	P7040.180 35-29-8FA-W 40hp
Approval	Standard
Stator variant	1
Frequency	60 Hz
Rated voltage	460 V
Number of poles	8
Phases	3~
Rated power	40 hp
Rated current	50 A
Starting current	271 A
Rated speed	885 rpm
Power factor	
1/1 Load	0.82
3/4 Load	0.79
1/2 Load	0.70
Motor efficiency	
1/1 Load	90.7 %
3/4 Load	91.5 %
1/2 Load	91.2 %

Configuration

Installation: L - Column pipe Semi permanent, Wet



Project

Project ID

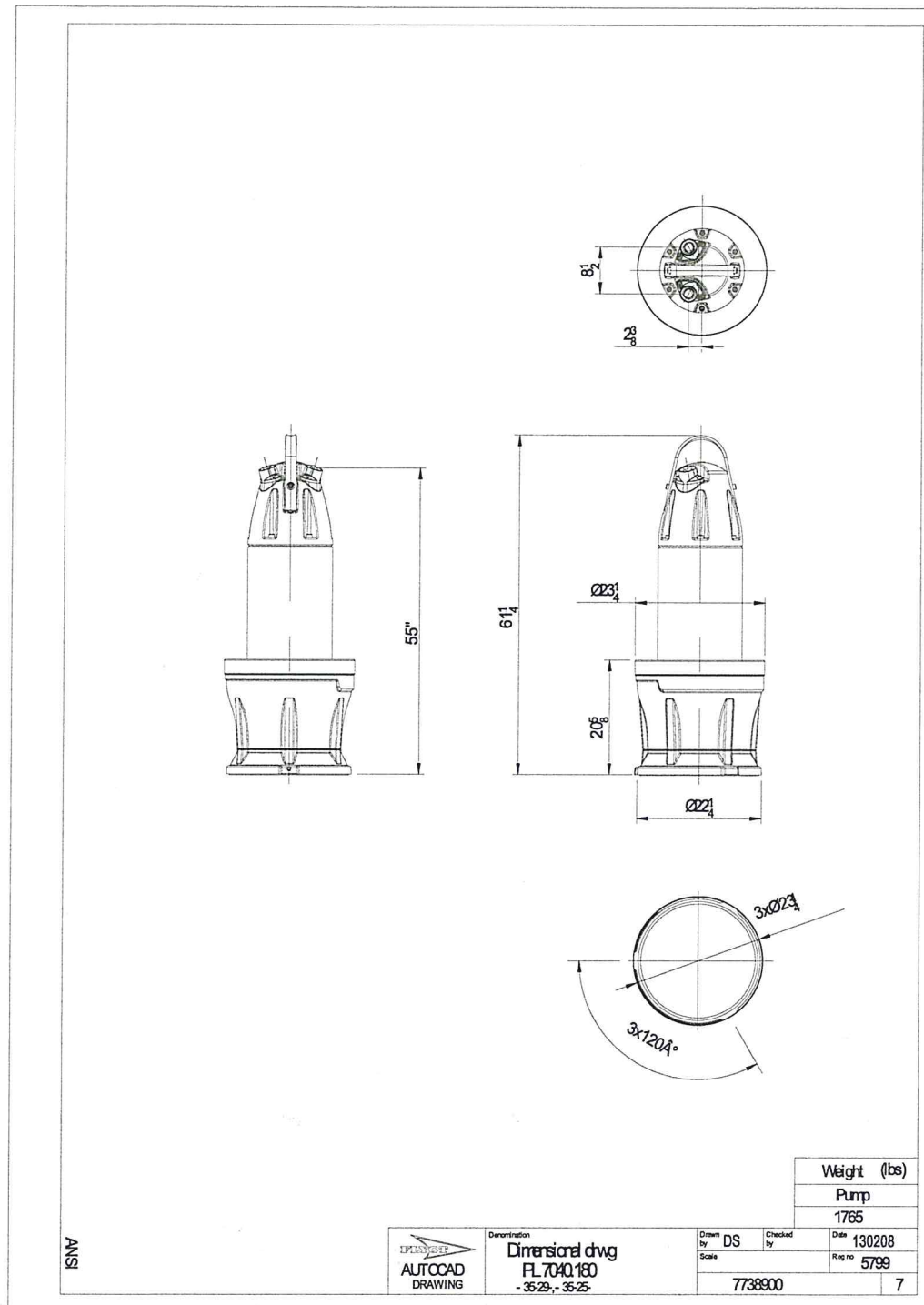
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Created on
2017-01-19

Last update

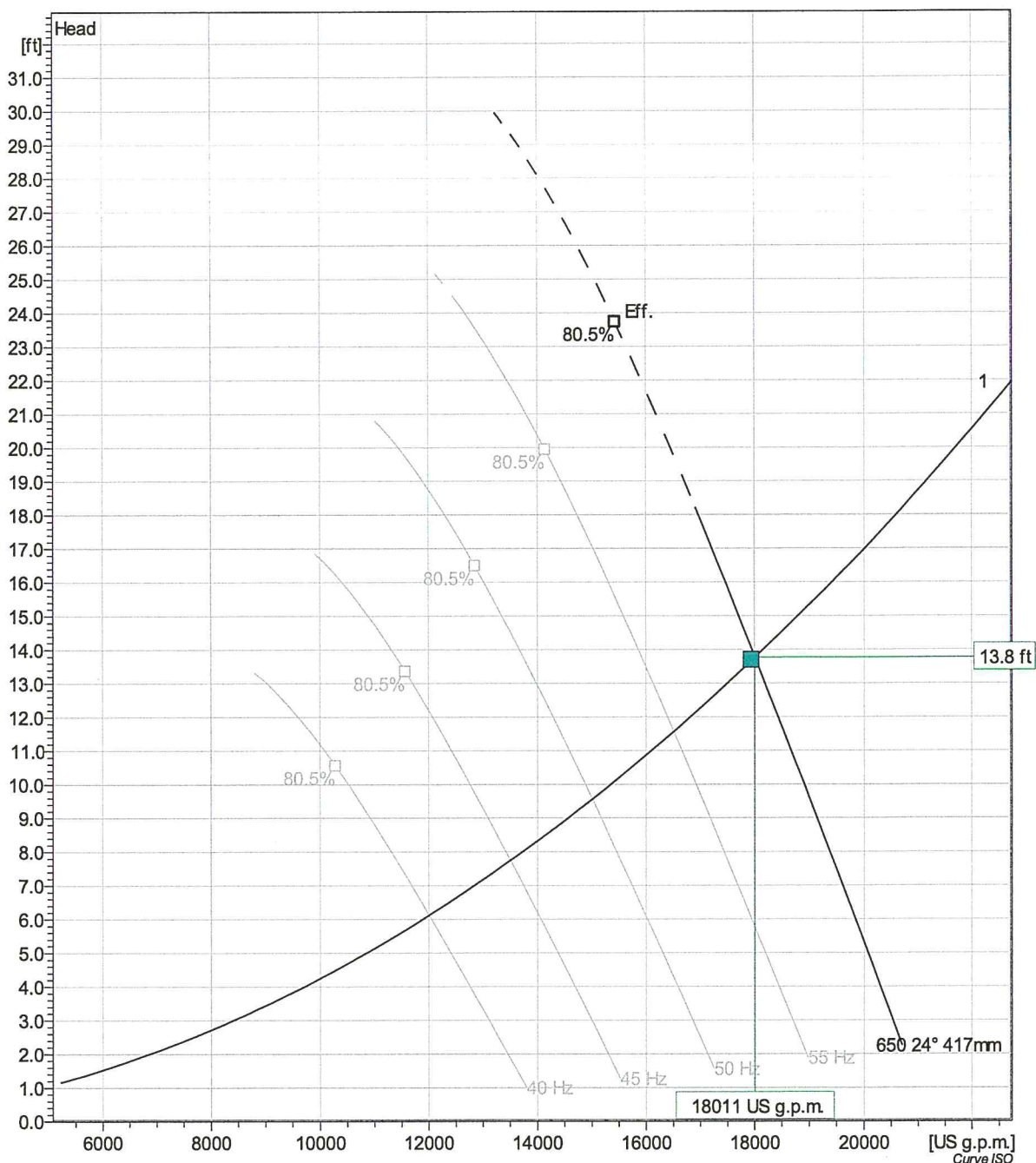
PL 7040 ** 3~ 650

Dimensional drawing



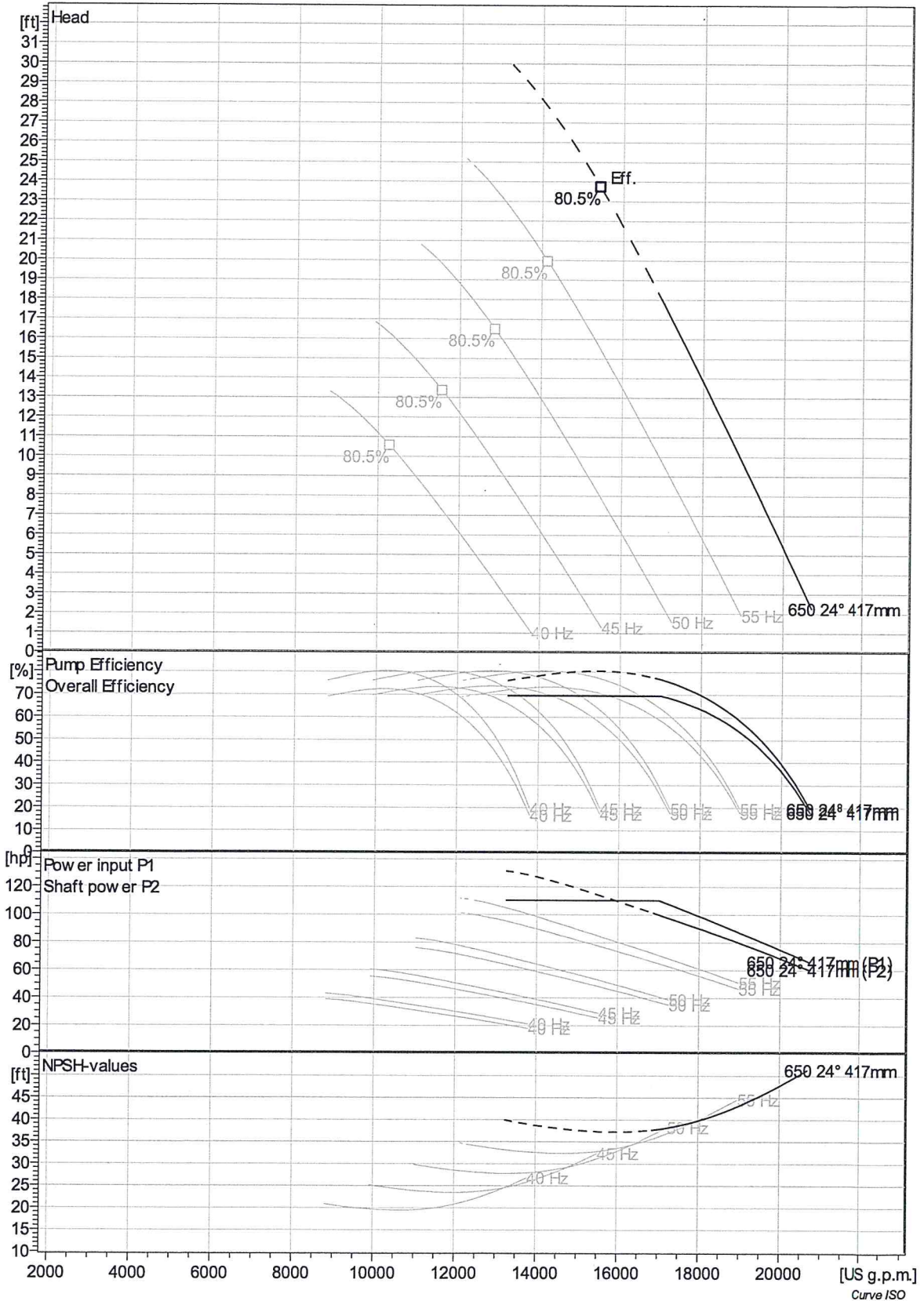
Project	Project ID	Created by	Created on 2017-01-19	Last update
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PL 7040 ** 3~ 650 VFD Analysis



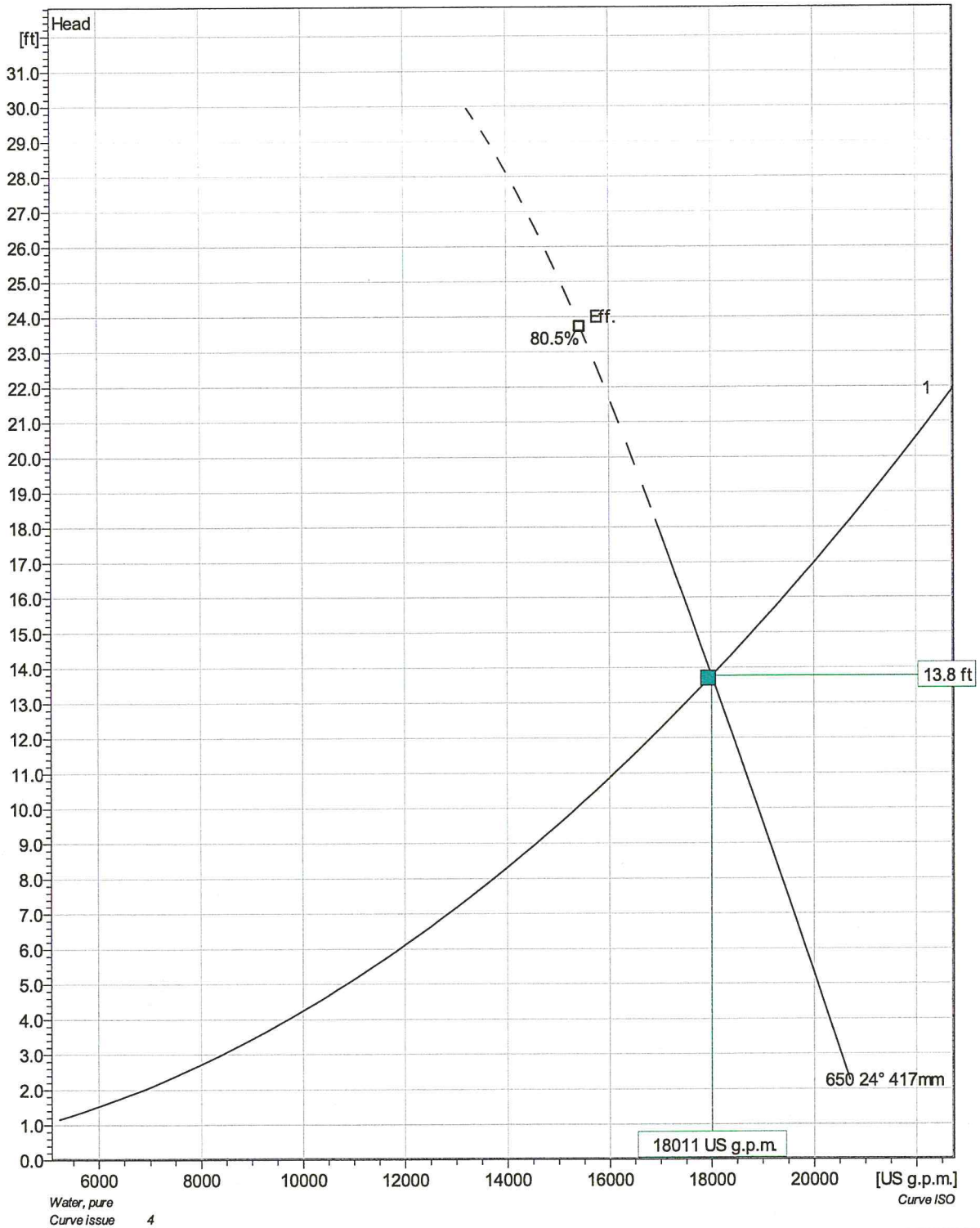
Pumps running /System	Frequency	Flow	Head	Shaft power	Flow	Head	Shaft power	Hyd eff.	Specific energy	NPSH _{re}
1	60 Hz	18000 US g.p.m.	13.8 ft	90 hp	18000 US g.p.m.	13.8 ft	90 hp	69.7 %	68.2 kWh/US MG	39.8 ft
1	55 Hz	16500 US g.p.m.	11.6 ft	69.3 hp	16500 US g.p.m.	11.6 ft	69.3 hp	69.7 %	56.9 kWh/US MG	34.6 ft
1	50 Hz	15000 US g.p.m.	9.56 ft	52.1 hp	15000 US g.p.m.	9.56 ft	52.1 hp	69.7 %	47.2 kWh/US MG	29.7 ft
1	45 Hz	13500 US g.p.m.	7.74 ft	38 hp	13500 US g.p.m.	7.74 ft	38 hp	69.7 %	38.6 kWh/US MG	25.1 ft
1	40 Hz	12000 US g.p.m.	6.12 ft	26.7 hp	12000 US g.p.m.	6.12 ft	26.7 hp	69.7 %	31.2 kWh/US MG	20.8 ft

PL 7040 ** 3~ 650 VFD Curve



Project	Project ID	Created by	Created on 2017-01-19	Last update
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PL 7040 ** 3~ 650 Duty Analysis



Pumps running /System	Individual pump			Total					NPSH _{re}
	Flow	Head	Shaft power	Flow	Head	Shaft power	Pump eff.	Specific energy	
1	18000 US g.p.m.	13.8 ft	90 hp	18000 US g.p.m.	13.8 ft	90 hp	69.7 %	68.2 kWh/US MG	39.8 ft

Project	Project ID	Created by	Created on	Last update
			2017-01-19	

PL 7040 ** 3~ 650

Performance curve



Pump

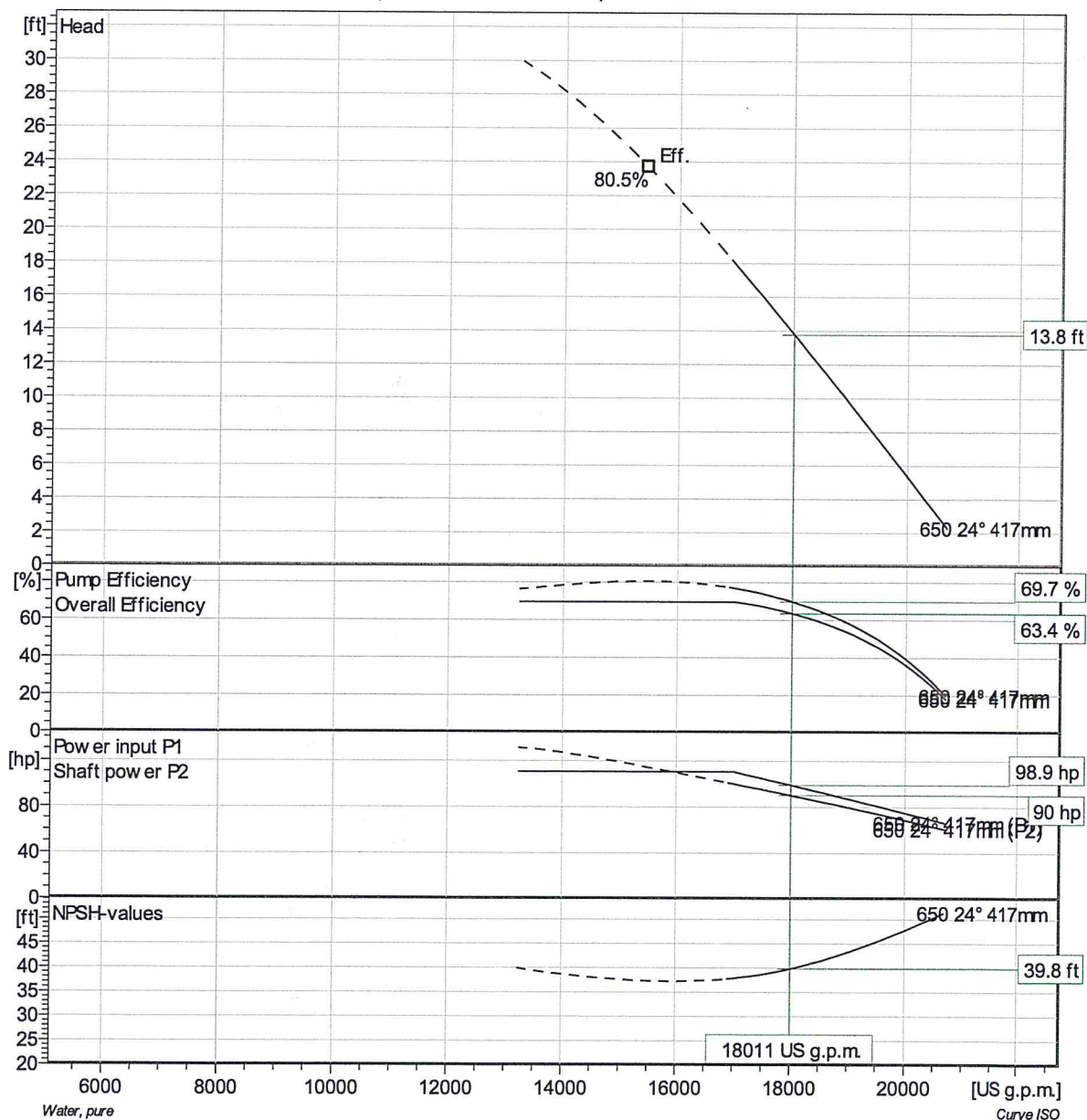
Column diameter 23 5/8 inch
Inlet diameter
Impeller diameter 16 7/16"
Number of blades 3

Motor

Motor # P7040.180 35-29-6AA-W 100hp
Approval Standard
Stator variant 1
Frequency 60 Hz
Rated voltage 460 V
Number of poles 6
Phases 3~
Rated power 100 hp
Rated current 127 A
Starting current 685 A
Rated speed 1180 rpm

Power factor
1/1 Load 0.82
3/4 Load 0.78
1/2 Load 0.69

Motor efficiency
1/1 Load 90.5 %
3/4 Load 91.5 %
1/2 Load 91.0 %



Duty point

Flow 18000 US g.p.m.
Head 13.7 ft

Guarantee

ISO_9906_Grad@Grade
No

Project

Project ID

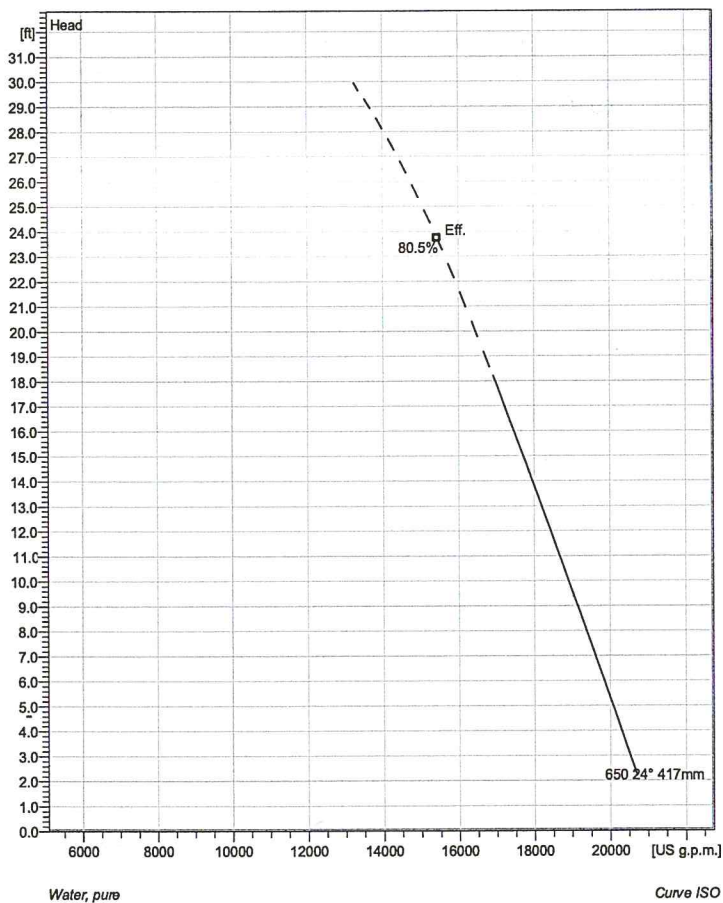
Created by

Created on
2017-01-19

Last update

PL 7040 ** 3~ 650

Technical specification



Note: Picture might not correspond to the current configuration.

General

Axial flow propeller pumps with fixed or adjustable pitch blades for high capacity low head pumping of clean or slightly contaminated liquids. Cast iron design optimized for high-flow efficiency.

Impeller

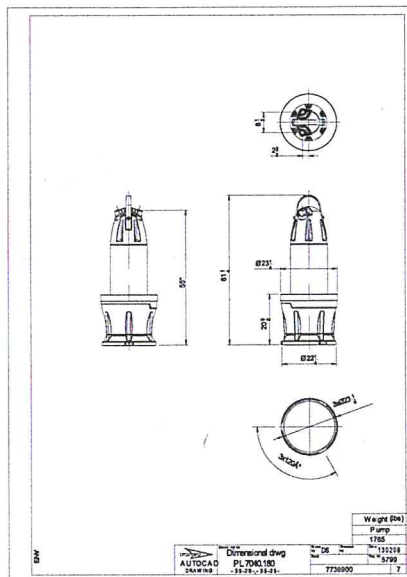
Impeller material	Stainless steel
Column diameter	23 5/8 inch
Inlet diameter	
Impeller diameter	417 mm
Number of blades	3

Motor

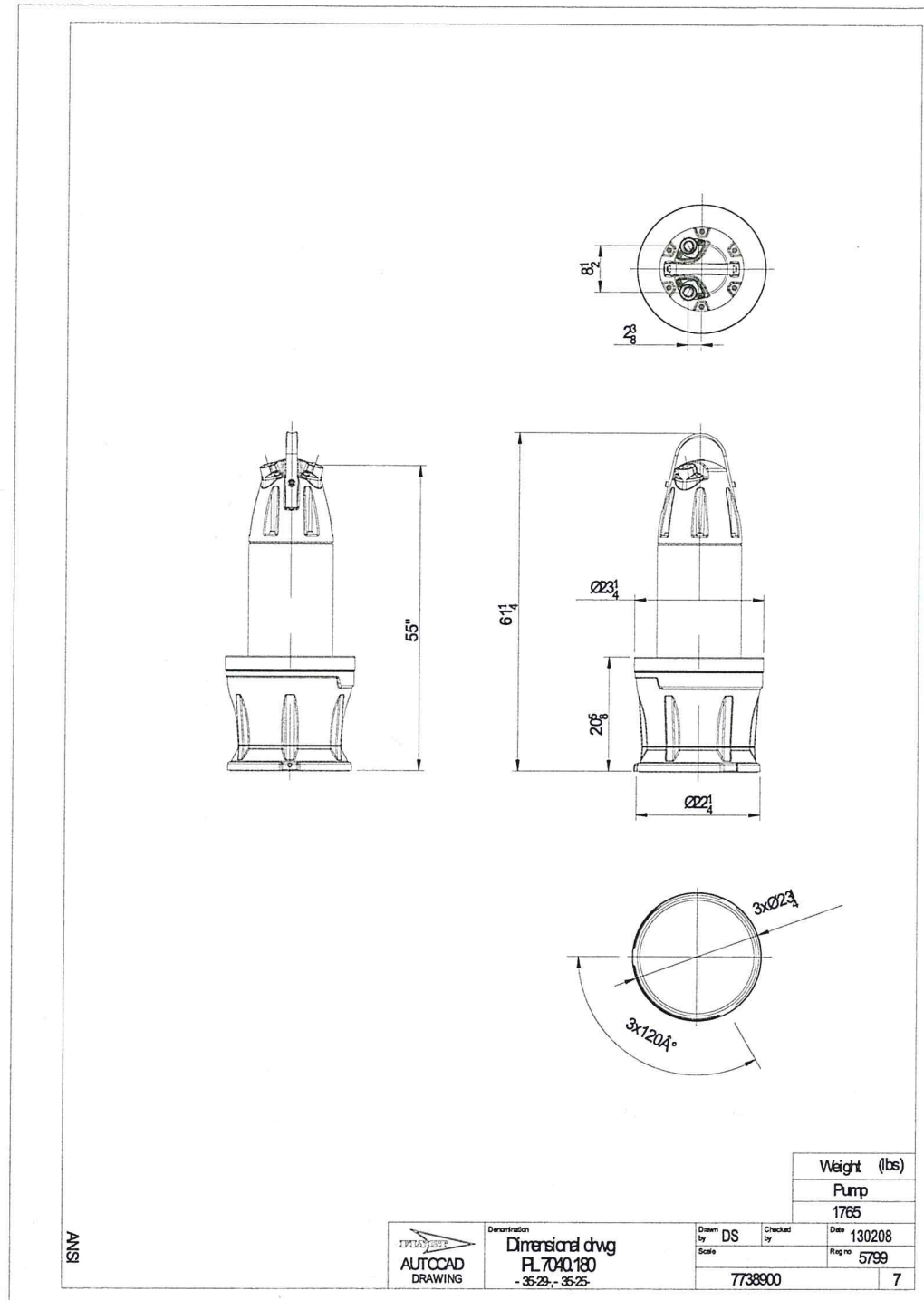
Motor #	P7040.180 35-29-6AA-W 100hp
Approval	Standard
Stator variant	1
Frequency	60 Hz
Rated voltage	460 V
Number of poles	6
Phases	3~
Rated power	100 hp
Rated current	127 A
Starting current	685 A
Rated speed	1180 rpm
Power factor	
1/1 Load	0.82
3/4 Load	0.78
1/2 Load	0.69
Motor efficiency	
1/1 Load	90.5 %
3/4 Load	91.5 %
1/2 Load	91.0 %

Configuration

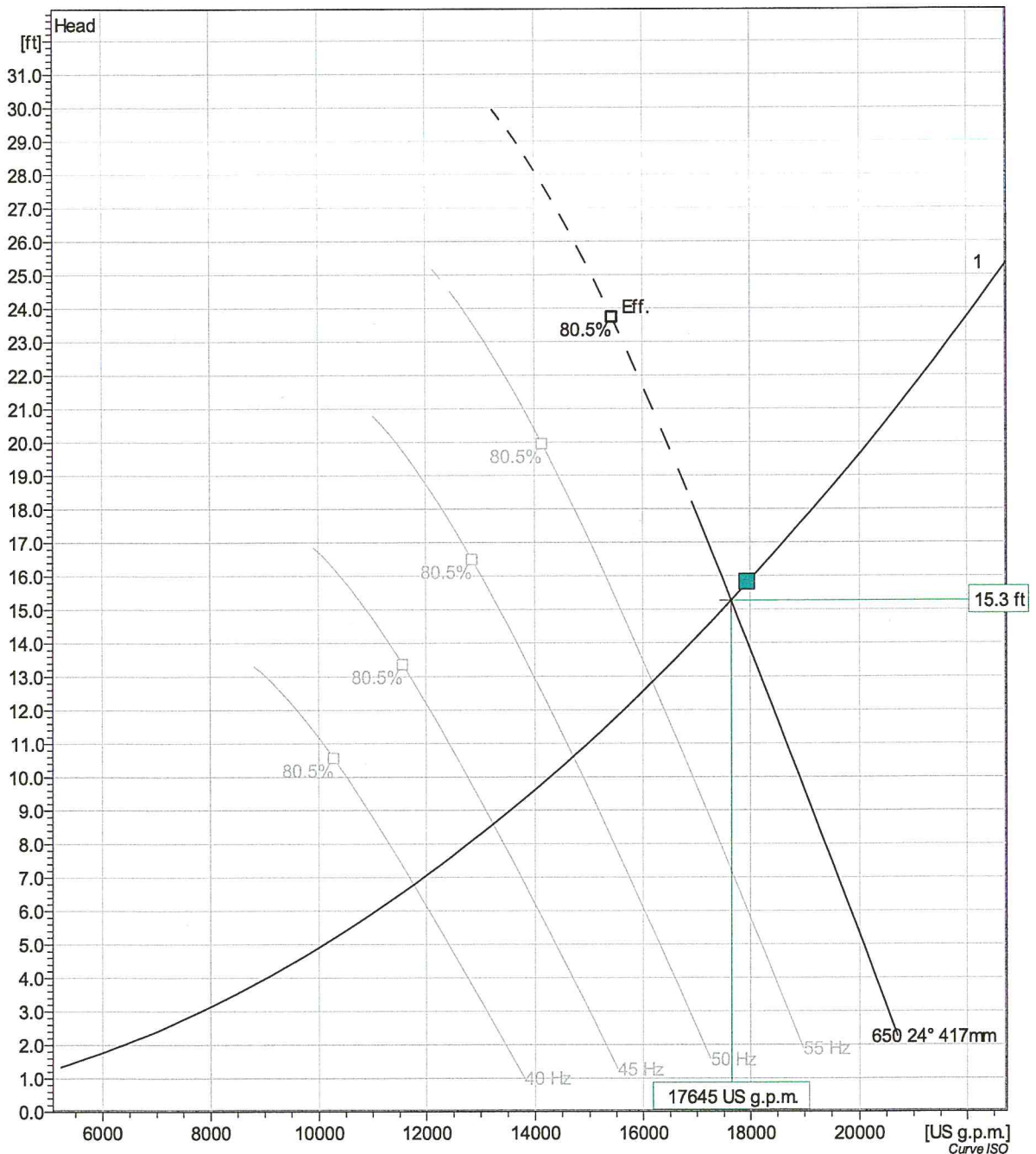
Installation: L - Column pipe Semi permanent, Wet



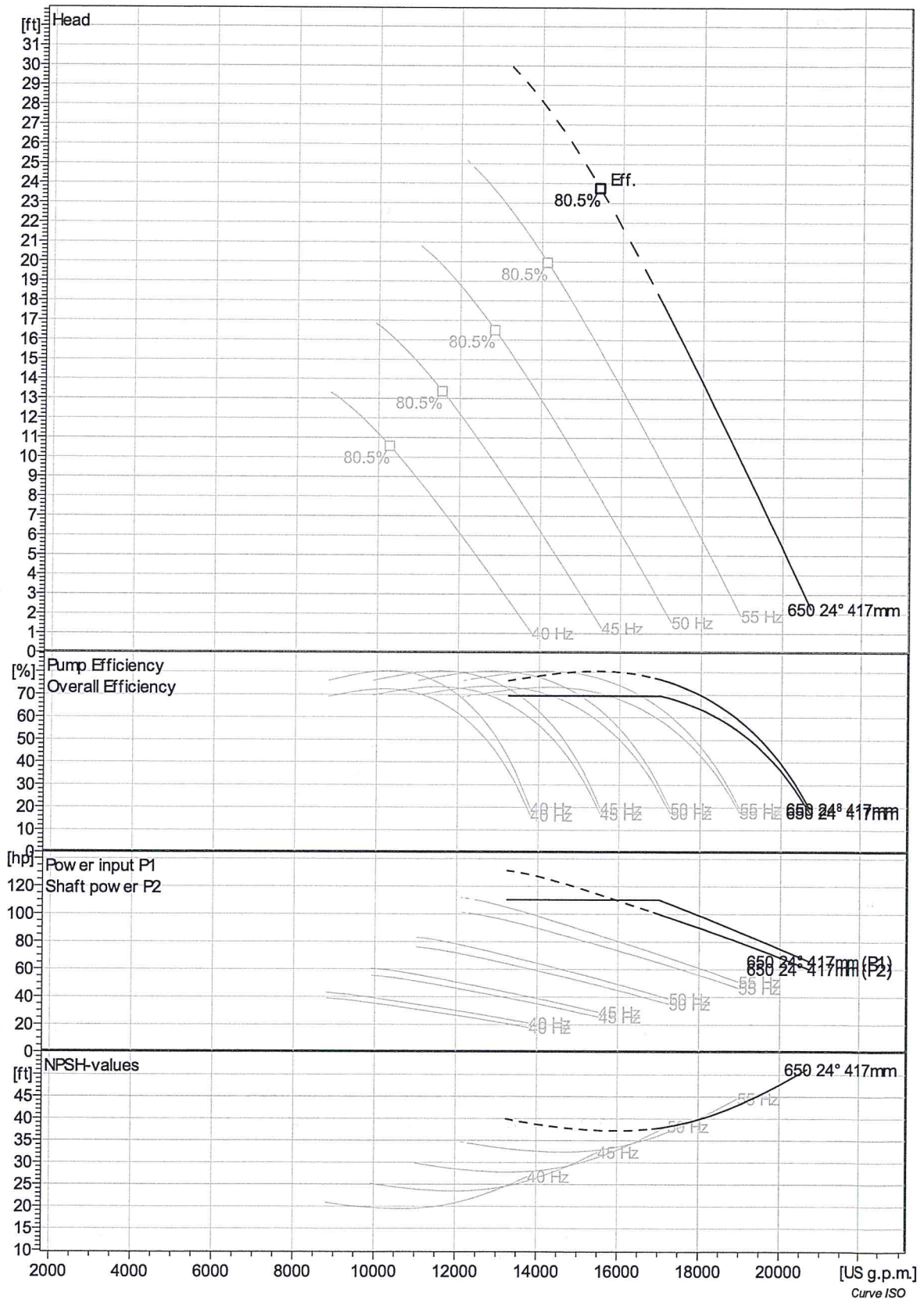
PL 7040 ** 3~ 650 Dimensional drawing



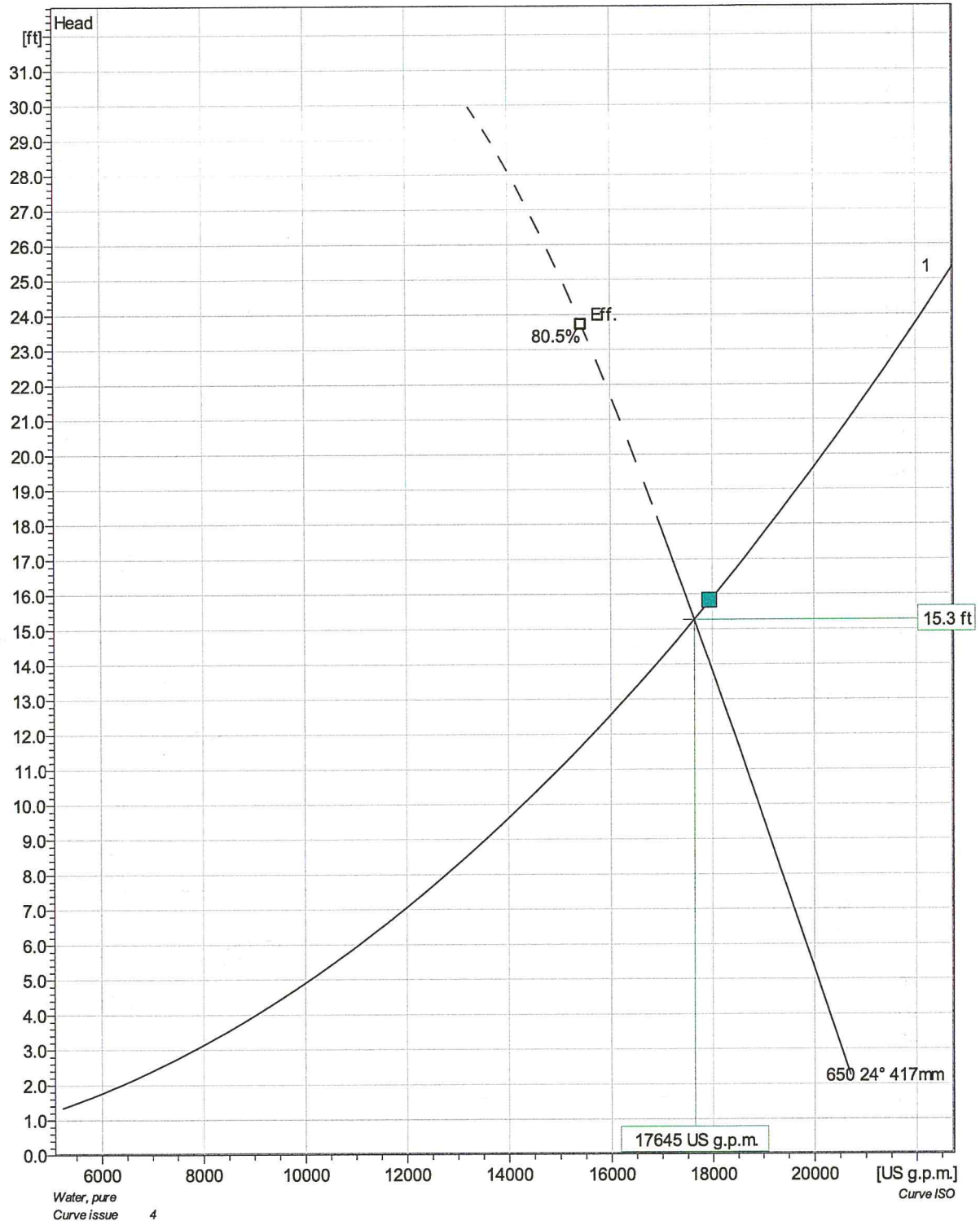
Project	Project ID	Created by	Created on	Last update
			2017-01-20	



Pumps running /System	Frequency	Flow	Head	Shaft power	Flow	Head	Shaft power	Hyd eff.	Specific energy	NPSHre
1	60 Hz	17600 US g.p.m.	15.3 ft	93.7 hp	17600 US g.p.m.	15.3 ft	93.7 hp	72.7 %	72.6 kWh/US MG	38.9 ft
1	55 Hz	16200 US g.p.m.	12.8 ft	72.2 hp	16200 US g.p.m.	12.8 ft	72.2 hp	72.7 %	60.5 kWh/US MG	33.9 ft
1	50 Hz	14700 US g.p.m.	10.6 ft	54.2 hp	14700 US g.p.m.	10.6 ft	54.2 hp	72.7 %	50.1 kWh/US MG	29.1 ft
1	45 Hz	13200 US g.p.m.	8.59 ft	39.5 hp	13200 US g.p.m.	8.59 ft	39.5 hp	72.7 %	40.9 kWh/US MG	24.6 ft
1	40 Hz	11800 US g.p.m.	6.79 ft	27.8 hp	11800 US g.p.m.	6.79 ft	27.8 hp	72.7 %	33 kWh/US MG	20.3 ft



PL 7040 ** 3~ 650 Duty Analysis



Individual pump				Total					
Pumps running /System	Flow	Head	Shaft power	Flow	Head	Shaft power	Pump eff.	Specific energy	NPSH _{re}
1	17600 US g.p.m.	15.3 ft	93.7 hp	17600 US g.p.m.	15.3 ft	93.7 hp	72.7 %	72.6 kWh/US MG	38.9 ft

Project	Project ID	Created by	Created on	Last update
			2017-01-20	

PL 7040 ** 3~ 650

Performance curve



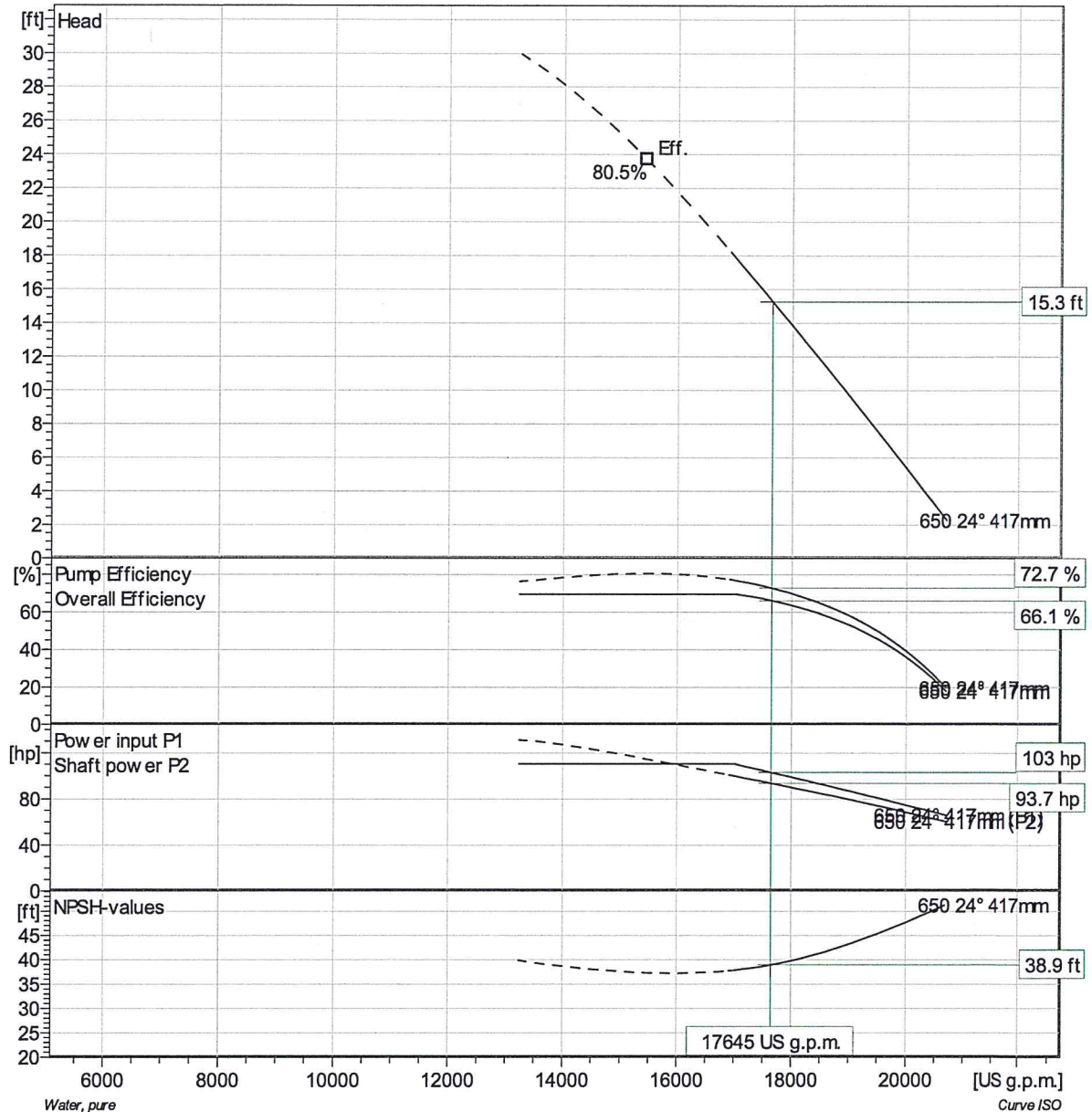
Pump

Column diameter 23 5/8 inch
Inlet diameter 16 7/16"
Impeller diameter 3
Number of blades 3

Motor

Motor # P7040.180 35-29-6AA-W 100hp
Approval Standard
Stator variant 1
Frequency 60 Hz
Rated voltage 460 V
Number of poles 6
Phases 3~
Rated power 100 hp
Rated current 127 A
Starting current 685 A
Rated speed 1180 rpm

Power factor
1/1 Load 0.82
3/4 Load 0.78
1/2 Load 0.69
Motor efficiency
1/1 Load 90.5 %
3/4 Load 91.5 %
1/2 Load 91.0 %



Duty point
Flow Head
18000 US g.p.m. 15.8 ft
Guarantee
ISO_9906_Grade
No

Project	Project ID	Created by	Created on	Last update
			2017-01-20	

Head [ft]

31.0
30.0
29.0
28.0
27.0
26.0
25.0
24.0
23.0
22.0
21.0
20.0
19.0
18.0
17.0
16.0
15.0
14.0
13.0
12.0
11.0
10.0
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0

6000 8000 10000 12000 14000 16000 18000 20000 [US g.p.m.]

Water, pure

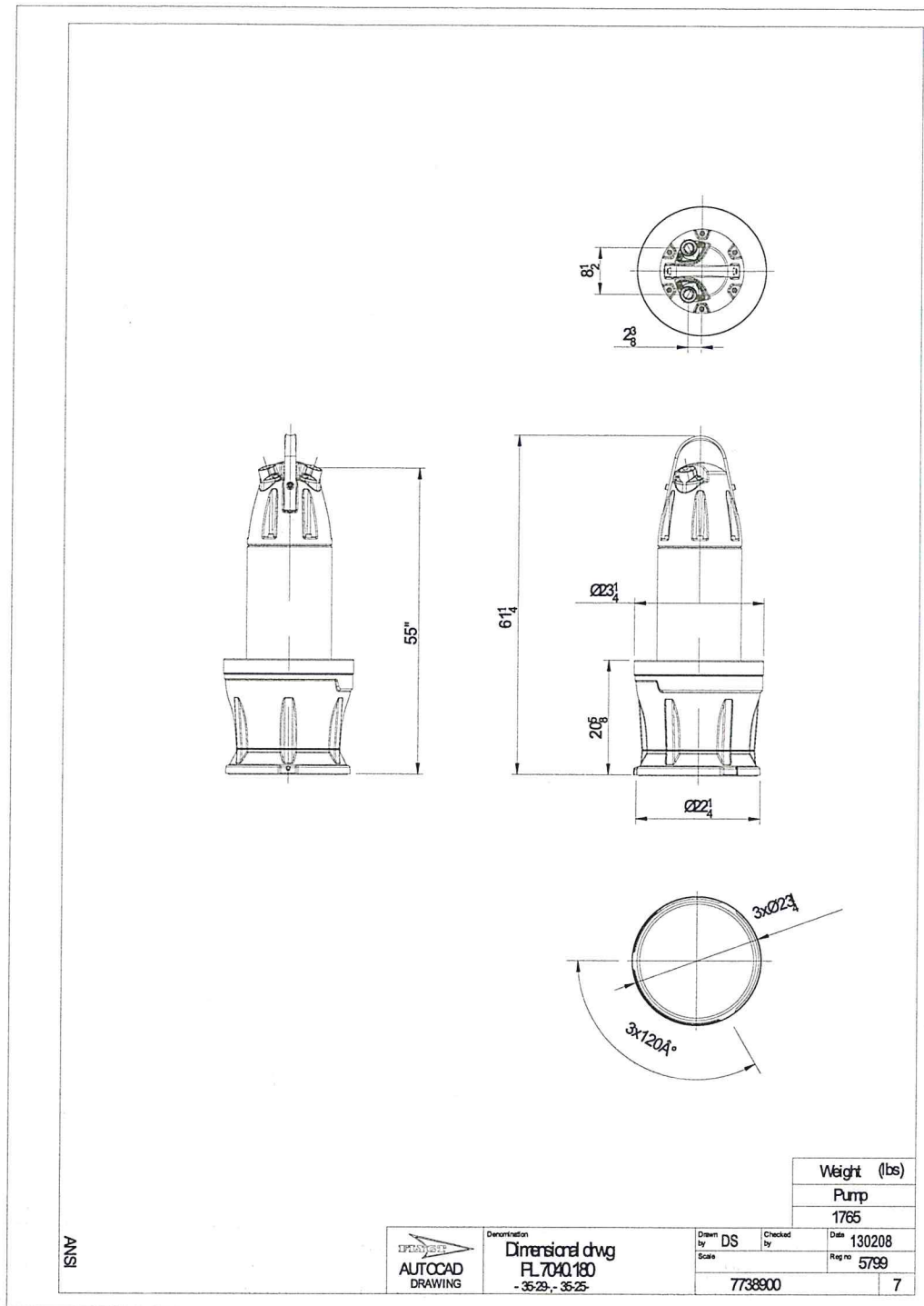
Curve ISO

650 24 417mm

80.5% Eff.

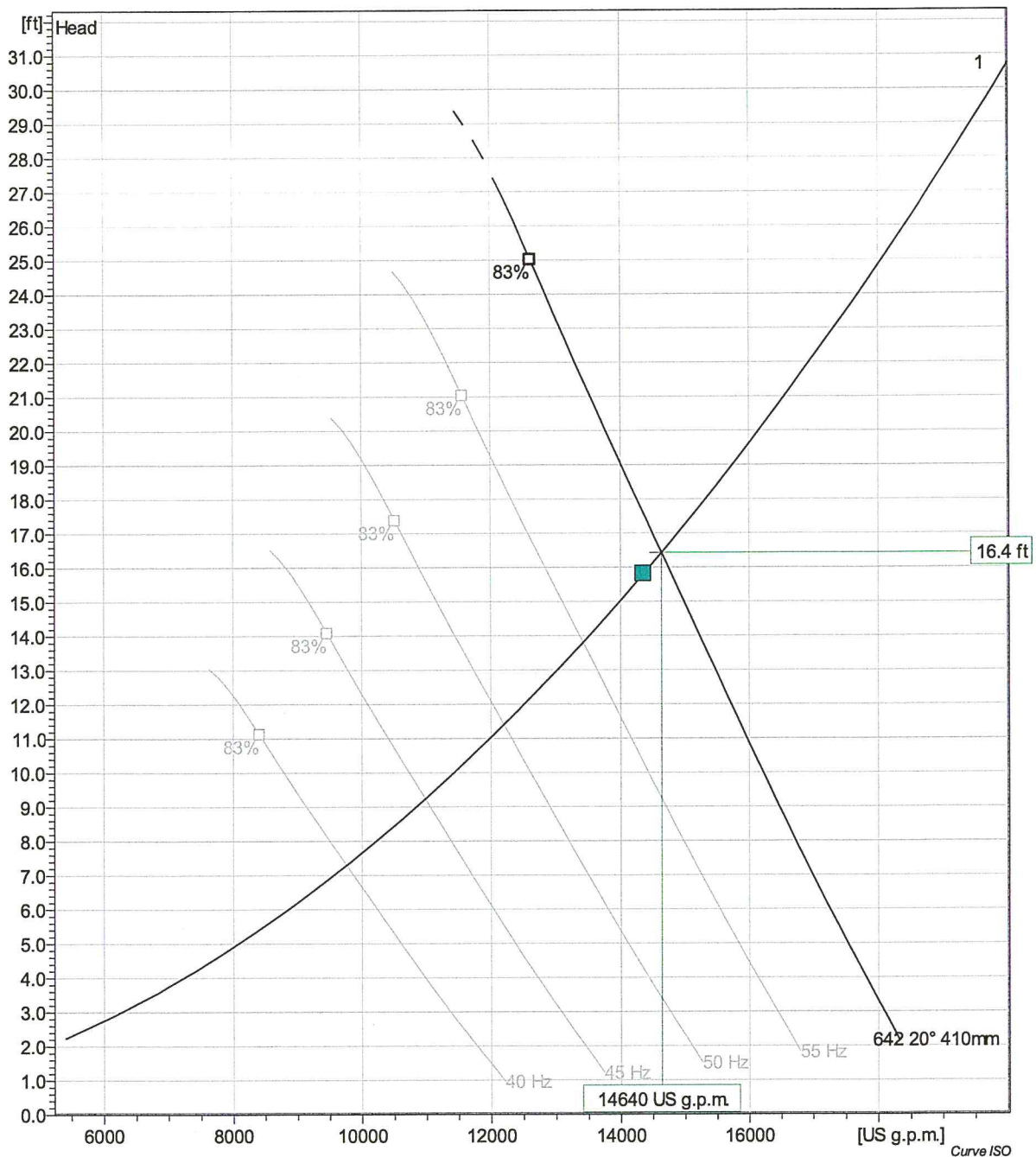
Configuration

PL 7040 ** 3~ 642
Dimensional drawing



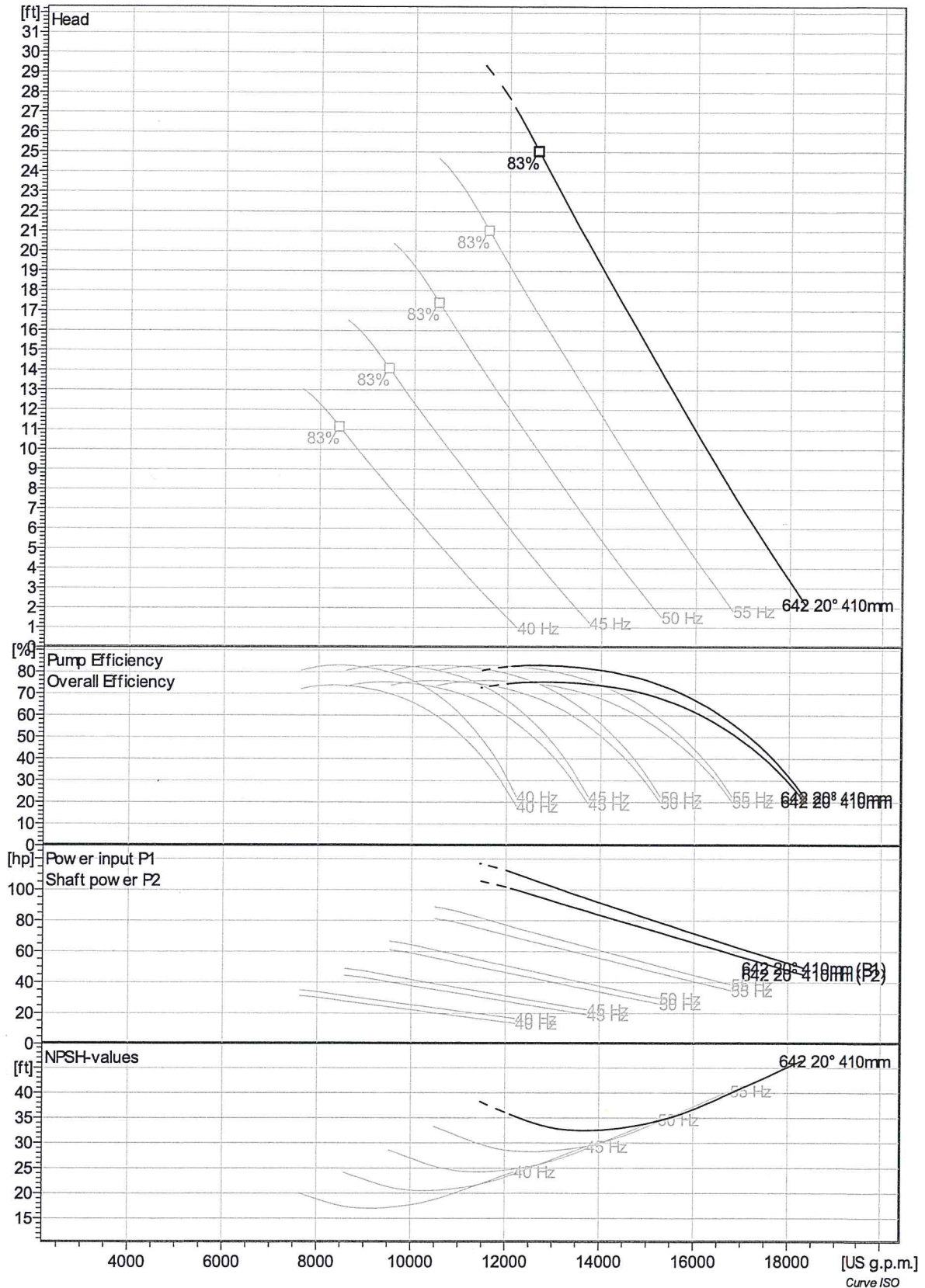
Project	Project ID	Created by	Created on	Last update
			2017-01-19	

PL 7040 ** 3~ 642 VFD Analysis

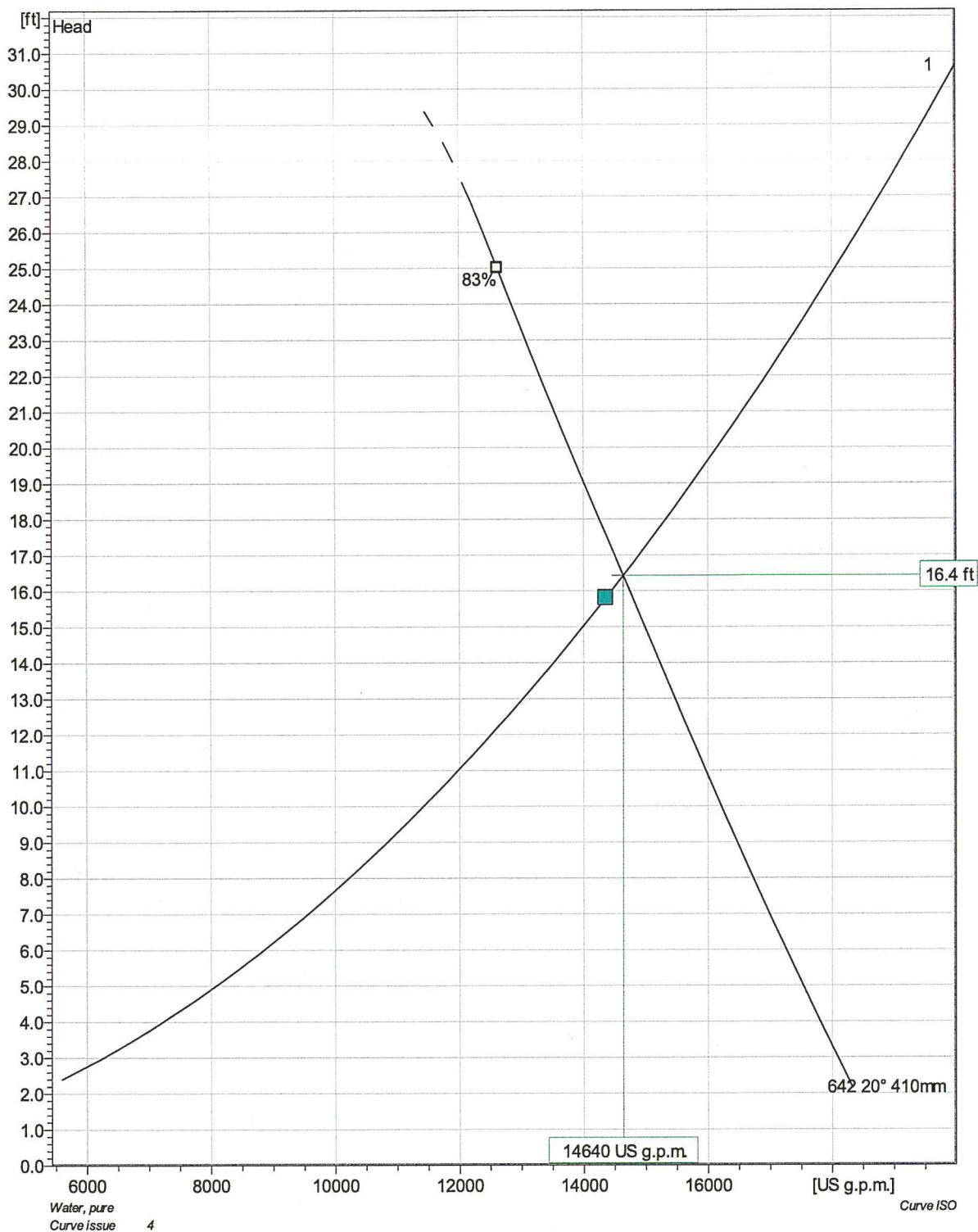


Pumps running /System	Frequency	Flow	Head	Shaft power	Flow	Head	Shaft power	Hyd eff.	Specific energy	NPSHre
1	60 Hz	14600 US g.p.m.	16.4 ft	77.9 hp	14600 US g.p.m.	16.4 ft	77.9 hp	78.1 %	72.3 kWh/US MG	33.2 ft
1	55 Hz	13400 US g.p.m.	13.8 ft	60 hp	13400 US g.p.m.	13.8 ft	60 hp	78.1 %	60.7 kWh/US MG	28.9 ft
1	50 Hz	12200 US g.p.m.	11.4 ft	45.1 hp	12200 US g.p.m.	11.4 ft	45.1 hp	78.1 %	50.4 kWh/US MG	24.8 ft
1	45 Hz	11000 US g.p.m.	9.24 ft	32.9 hp	11000 US g.p.m.	9.24 ft	32.9 hp	78.1 %	41.4 kWh/US MG	21 ft
1	40 Hz	9760 US g.p.m.	7.3 ft	23.1 hp	9760 US g.p.m.	7.3 ft	23.1 hp	78.1 %	33.7 kWh/US MG	17.4 ft

PL 7040 ** 3~ 642 VFD Curve



Project	Project ID	Created by	Created on 2017-01-19	Last update
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Pumps running /System	Individual pump			Total					NPSH _{re}
	Flow	Head	Shaft power	Flow	Head	Shaft power	Pump eff.	Specific energy	
1	14600 US g.p.m.	16.4 ft	77.9 hp	14600 US g.p.m.	16.4 ft	77.9 hp	78.1 %	72.3 kWh/US MG	33.2 ft

Project	Project ID	Created by	Created on	Last update
			2017-01-19	

PL 7040 ** 3~ 642

Performance curve



Pump

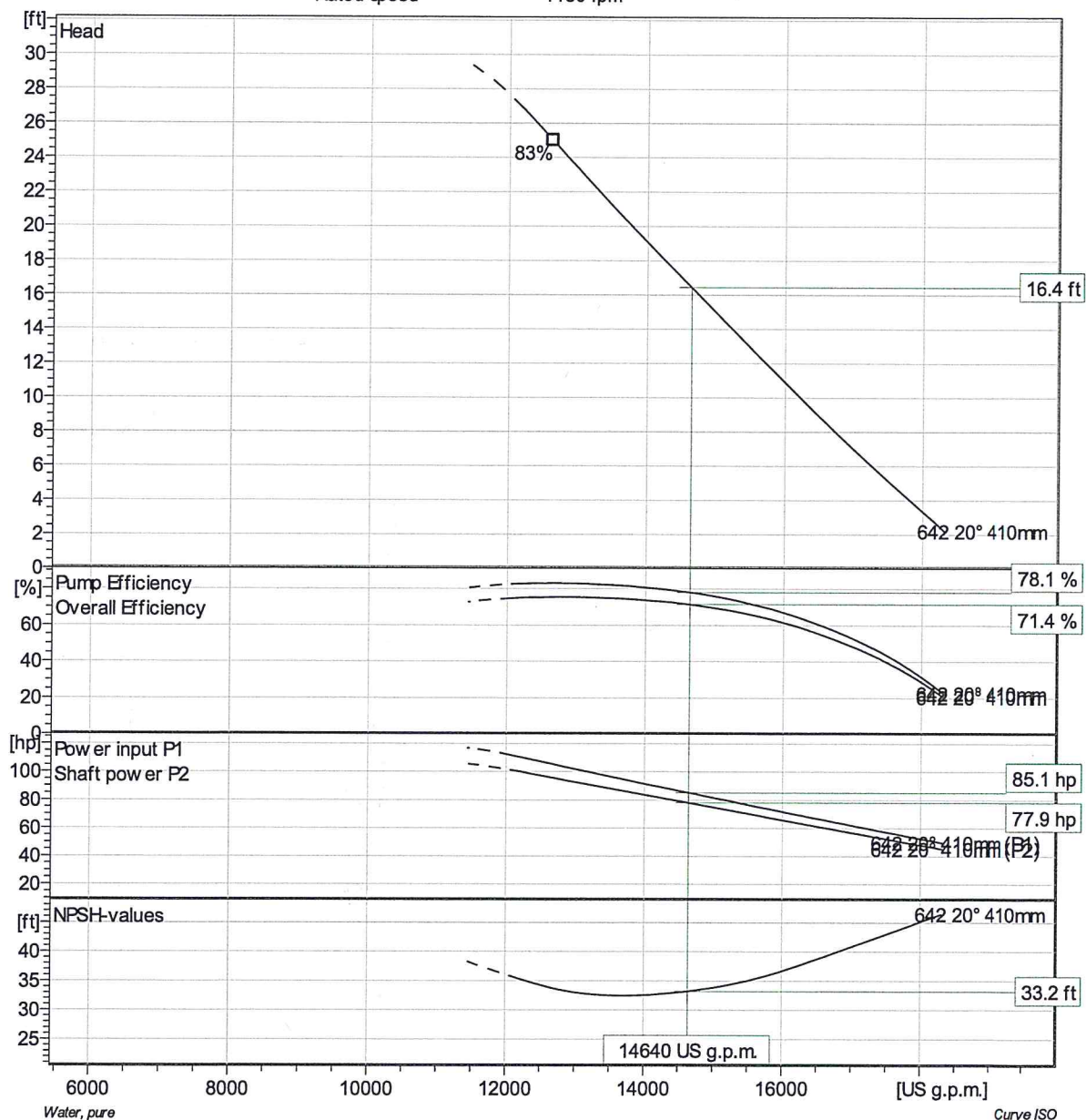
Column diameter 23 5/8 inch
Inlet diameter
Impeller diameter 16 1/8"
Number of blades 3

Motor

Motor # P7040.180 35-29-6AA-W 100hp
Approval Standard
Stator variant 1
Frequency 60 Hz
Rated voltage 460 V
Number of poles 6
Phases 3~
Rated power 100 hp
Rated current 127 A
Starting current 685 A
Rated speed 1180 rpm

Power factor
1/1 Load 0.82
3/4 Load 0.78
1/2 Load 0.69

Motor efficiency
1/1 Load 90.5 %
3/4 Load 91.5 %
1/2 Load 91.0 %

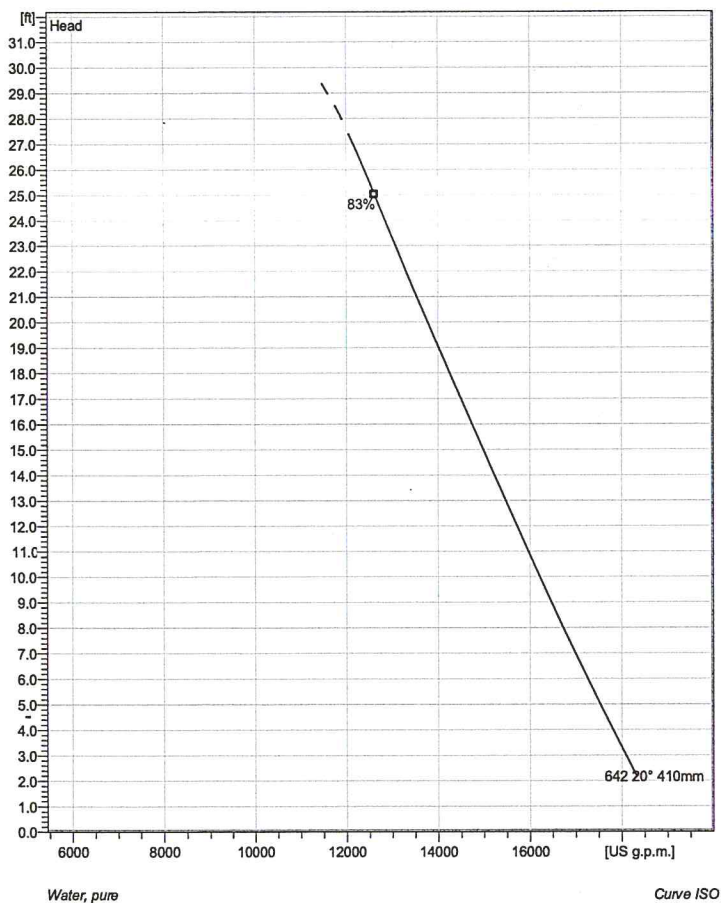


Duty point
Flow 14400 US g.p.m. Head 15.8 ft
Guarantee
ISO_9906_Grade No

Project	Project ID	Created by	Created on	Last update
			2017-01-19	

PL 7040 ** 3~ 642

Technical specification



Note: Picture might not correspond to the current configuration.

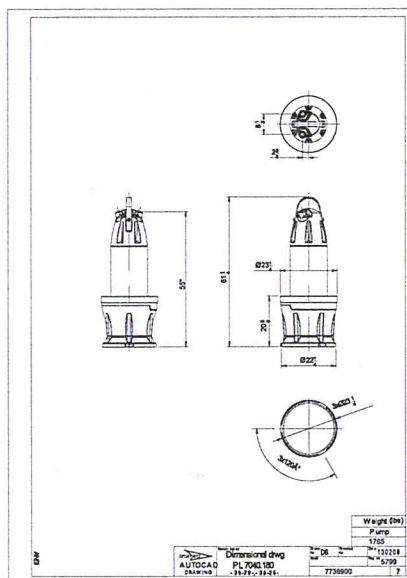
General

Axial flow propeller pumps with fixed or adjustable pitch blades for high capacity low head pumping of clean or slightly contaminated liquids. Cast iron design optimized for high-flow efficiency.

Impeller

Impeller material	Stainless steel
Column diameter	23 5/8 inch
Inlet diameter	
Impeller diameter	410 mm
Number of blades	3

Installation: L - Column pipe Semi permanent, Wet



Motor

Motor #	P7040.180 35-29-6AA-W 100hp
Approval	Standard
Stator variant	1
Frequency	60 Hz
Rated voltage	460 V
Number of poles	6
Phases	3~
Rated power	100 hp
Rated current	127 A
Starting current	685 A
Rated speed	1180 rpm
Power factor	
1/1 Load	0.82
3/4 Load	0.78
1/2 Load	0.69
Motor efficiency	
1/1 Load	90.5 %
3/4 Load	91.5 %
1/2 Load	91.0 %

Configuration

Project

Project ID

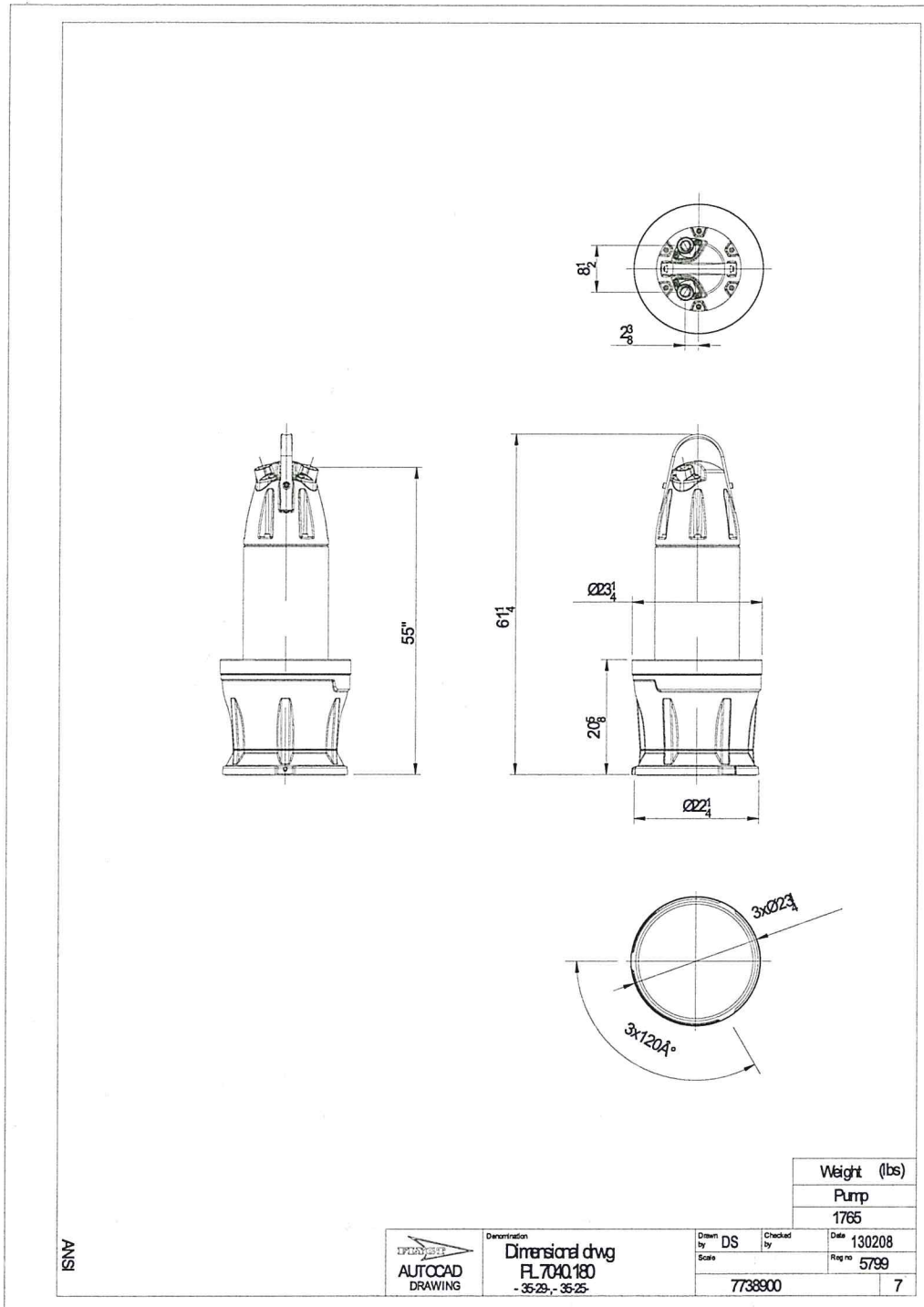
Created by

Created on

Last update

2017-01-19

PL 7040 ** 3~ 642
Dimensional drawing



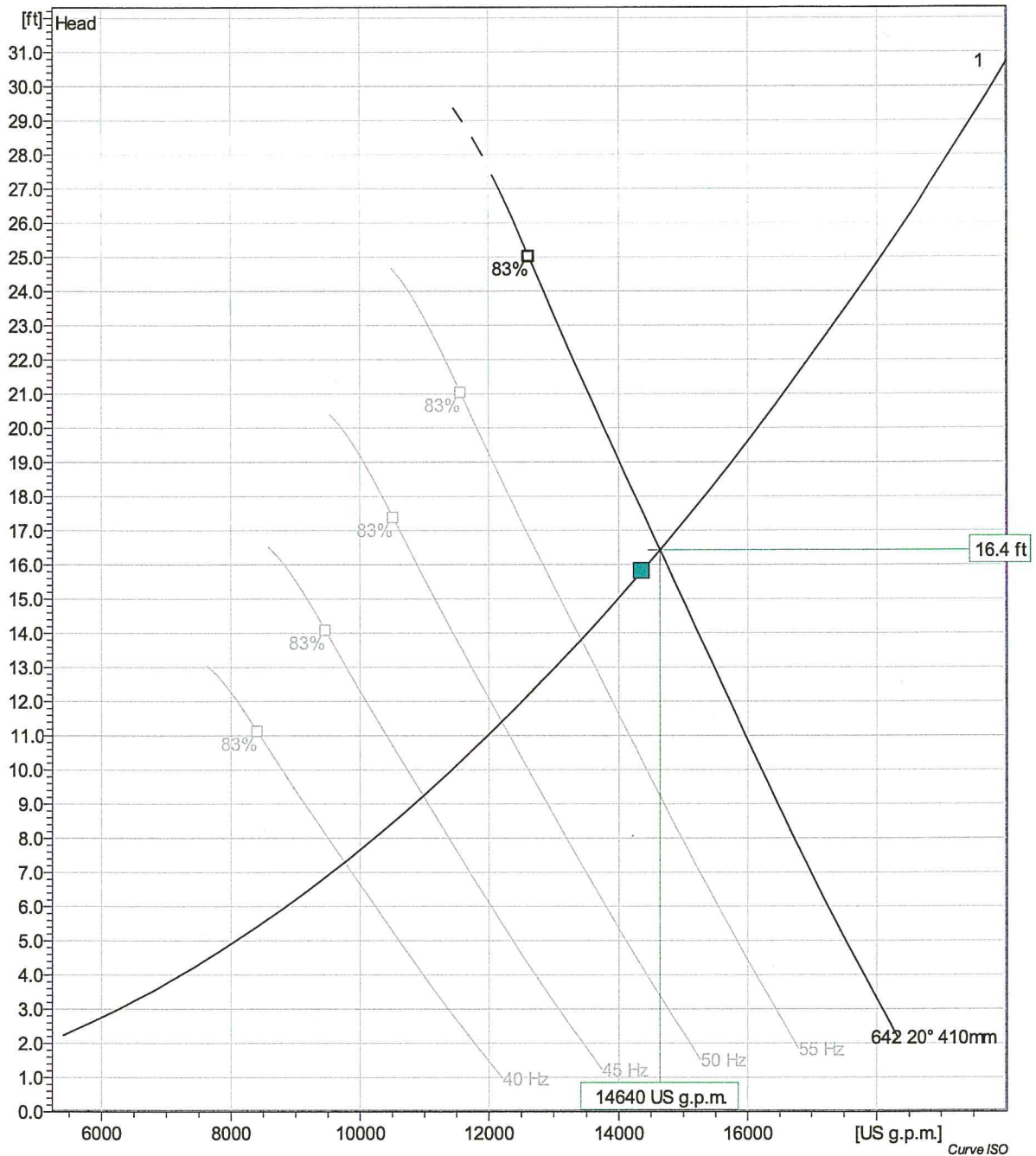
Project

Project ID

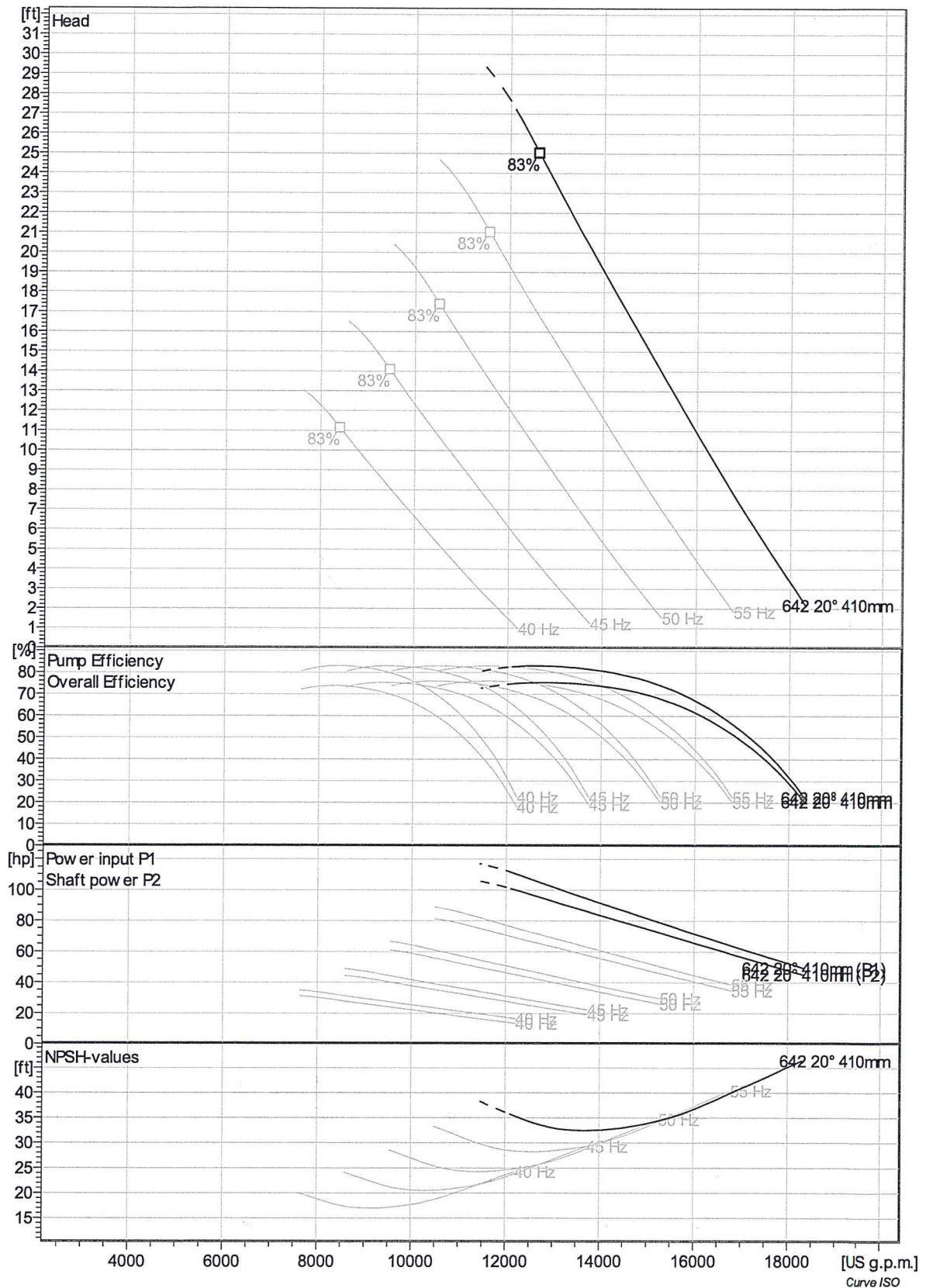
Created by

Created on
2017-01-19

Last update



Pumps running /System	Frequency	Flow	Head	Shaft power	Flow	Head	Shaft power	Hyd. eff.	Specific energy	NPSHre
1	60 Hz	14600 US g.p.m.	16.4 ft	77.9 hp	14600 US g.p.m.	16.4 ft	77.9 hp	78.1 %	72.3 kWh/US MG	33.2 ft
1	55 Hz	13400 US g.p.m.	13.8 ft	60 hp	13400 US g.p.m.	13.8 ft	60 hp	78.1 %	60.7 kWh/US MG	28.9 ft
1	50 Hz	12200 US g.p.m.	11.4 ft	45.1 hp	12200 US g.p.m.	11.4 ft	45.1 hp	78.1 %	50.4 kWh/US MG	24.8 ft
1	45 Hz	11000 US g.p.m.	9.24 ft	32.9 hp	11000 US g.p.m.	9.24 ft	32.9 hp	78.1 %	41.4 kWh/US MG	21 ft
1	40 Hz	9760 US g.p.m.	7.3 ft	23.1 hp	9760 US g.p.m.	7.3 ft	23.1 hp	78.1 %	33.7 kWh/US MG	17.4 ft



Project

Project ID

Created by

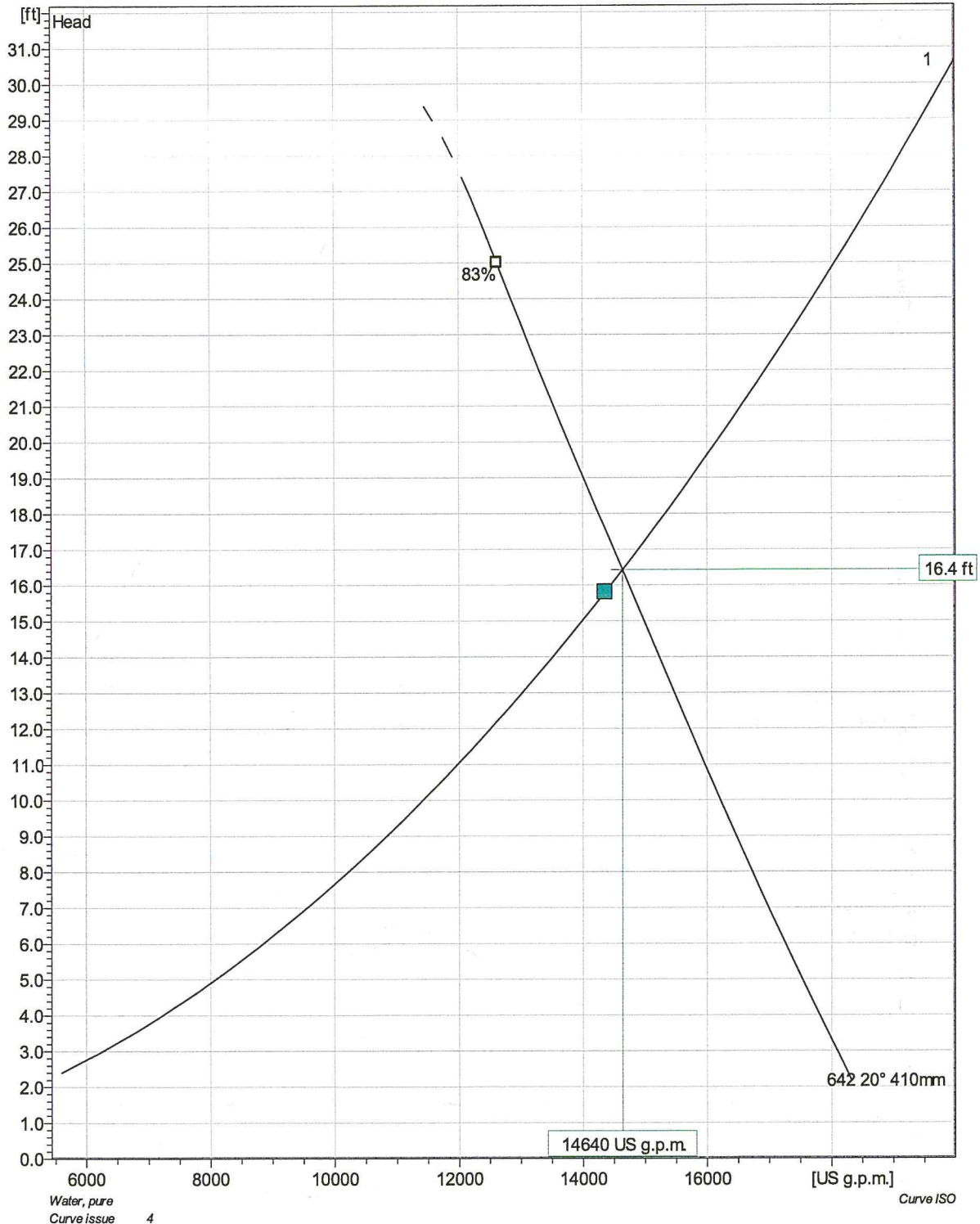
Created on

Last update

2017-01-19

Curve ISO

PL 7040 ** 3~ 642 Duty Analysis



Pumps running /System	Individual pump			Total					Specific energy	NPSH _{re}
	Flow	Head	Shaft power	Flow	Head	Shaft power	Pump eff.			
1	14600 US g.p.m.	16.4 ft	77.9 hp	14600 US g.p.m.	16.4 ft	77.9 hp	78.1 %	72.3 kWh/US MG		33.2 ft

Project	Project ID	Created by	Created on	Last update
			2017-01-19	

PL 7040 ** 3~ 642

Performance curve



Pump

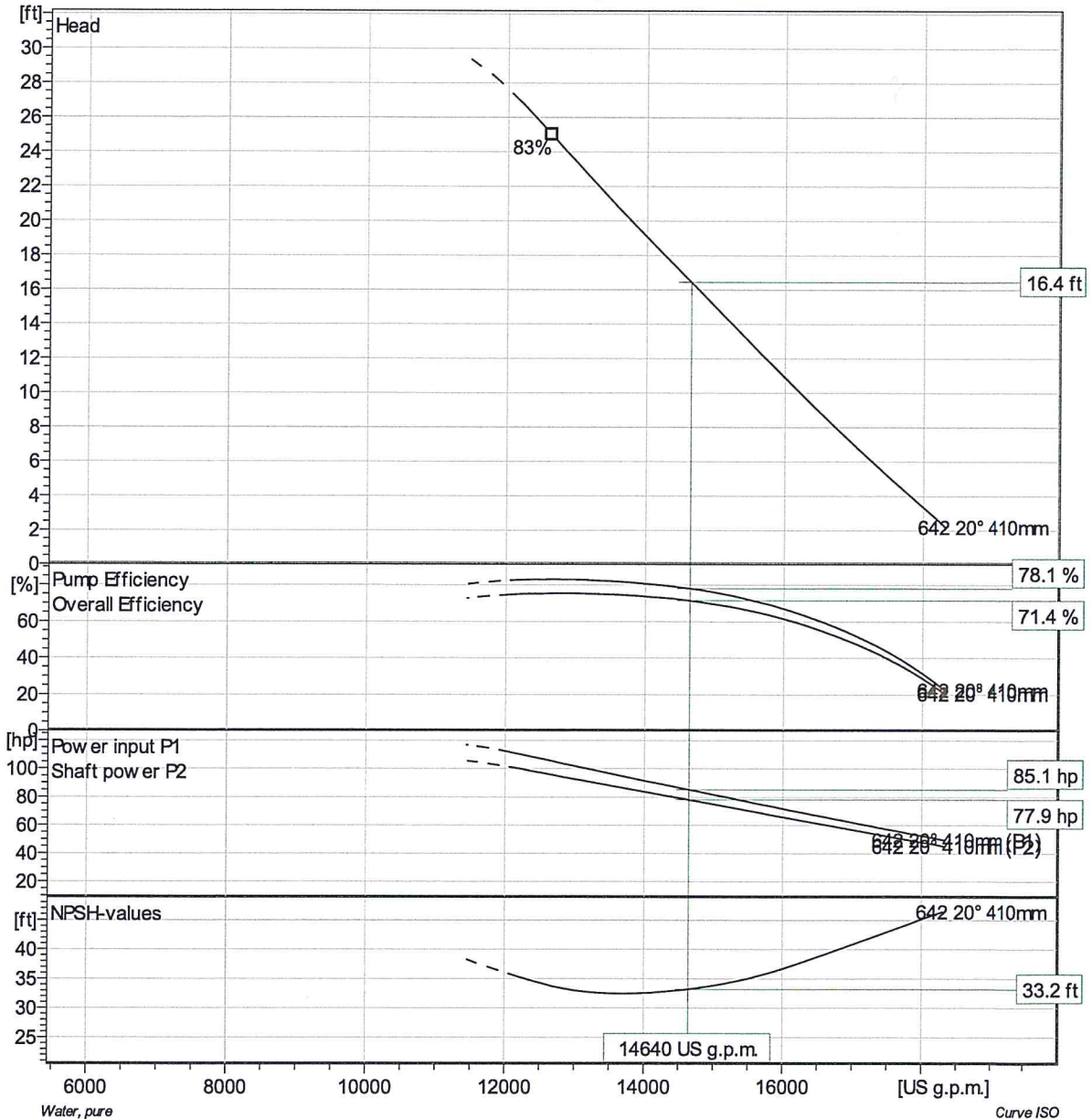
Column diameter 23 5/8 inch
Inlet diameter
Impeller diameter 16 1/8"
Number of blades 3

Motor

Motor # P7040.180 35-29-6AA-W 100hp
Approval Standard
Stator variant 1
Frequency 60 Hz
Rated voltage 460 V
Number of poles 6
Phases 3~
Rated power 100 hp
Rated current 127 A
Starting current 685 A
Rated speed 1180 rpm

Power factor
1/1 Load 0.82
3/4 Load 0.78
1/2 Load 0.69

Motor efficiency
1/1 Load 90.5 %
3/4 Load 91.5 %
1/2 Load 91.0 %



Duty point
Flow 14400 US g.p.m.
Head 15.8 ft
Guarantee
ISO_9906_Grade
No

Project	Project ID	Created by	Created on	Last update
			2017-01-19	

FLYGT



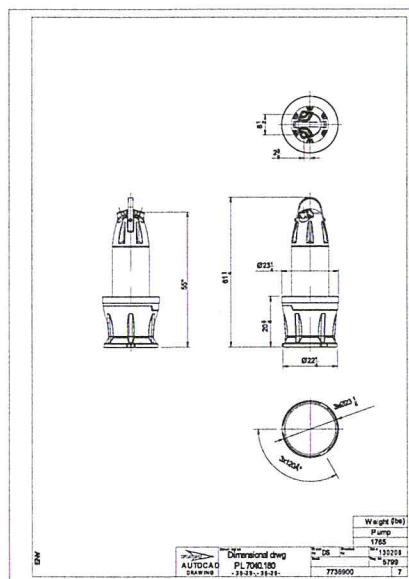
General
Axial flow propeller pumps with fixed or adjustable pitch blades for high capacity low head pumping of clean or slightly contaminated liquids. Cast iron design optimized for high-flow efficiency.

Impeller material	Stainless steel
Column diameter	23 5/8 inch
Inlet diameter	
Impeller diameter	410 mm
Number of blades	3

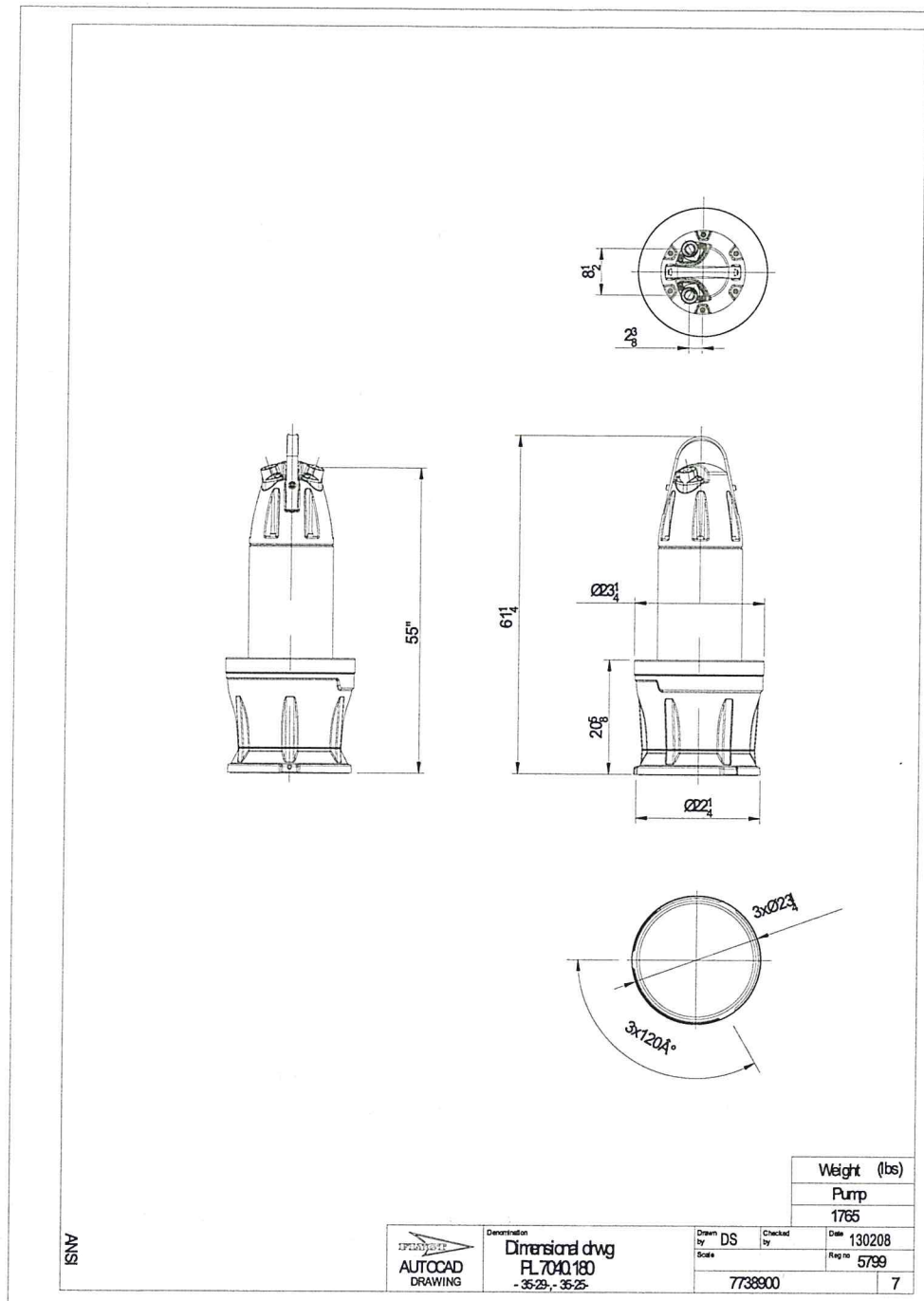
Motor #	P7040.180 35-29-6AA-W 100hp
Approval	Standard
Stator variant	1
Frequency	60 Hz
Rated voltage	460 V
Number of poles	6
Phases	3~
Rated power	100 hp
Rated current	127 A
Starting current	685 A
Rated speed	1180 rpm
Power factor	
1/1 Load	0.82
3/4 Load	0.78
1/2 Load	0.69
Motor efficiency	
1/1 Load	90.5 %
3/4 Load	91.5 %
1/2 Load	91.0 %

Configuration

Installation: L - Column pipe Semi permanent, Wet

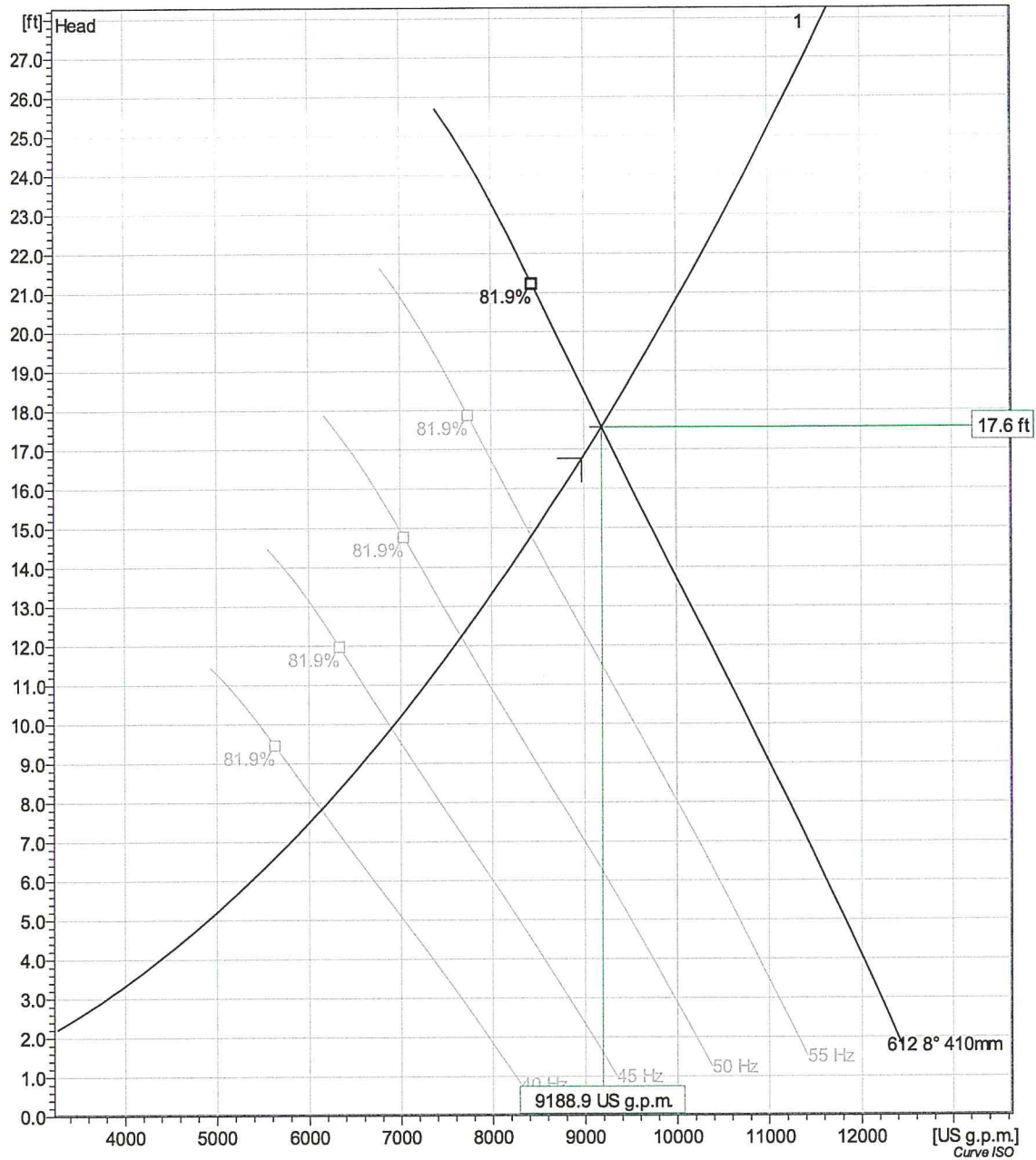


PL 7040 ** 3~ 612
Dimensional drawing



Project	Project ID	Created by	Created on	Last update
			2017-01-19	

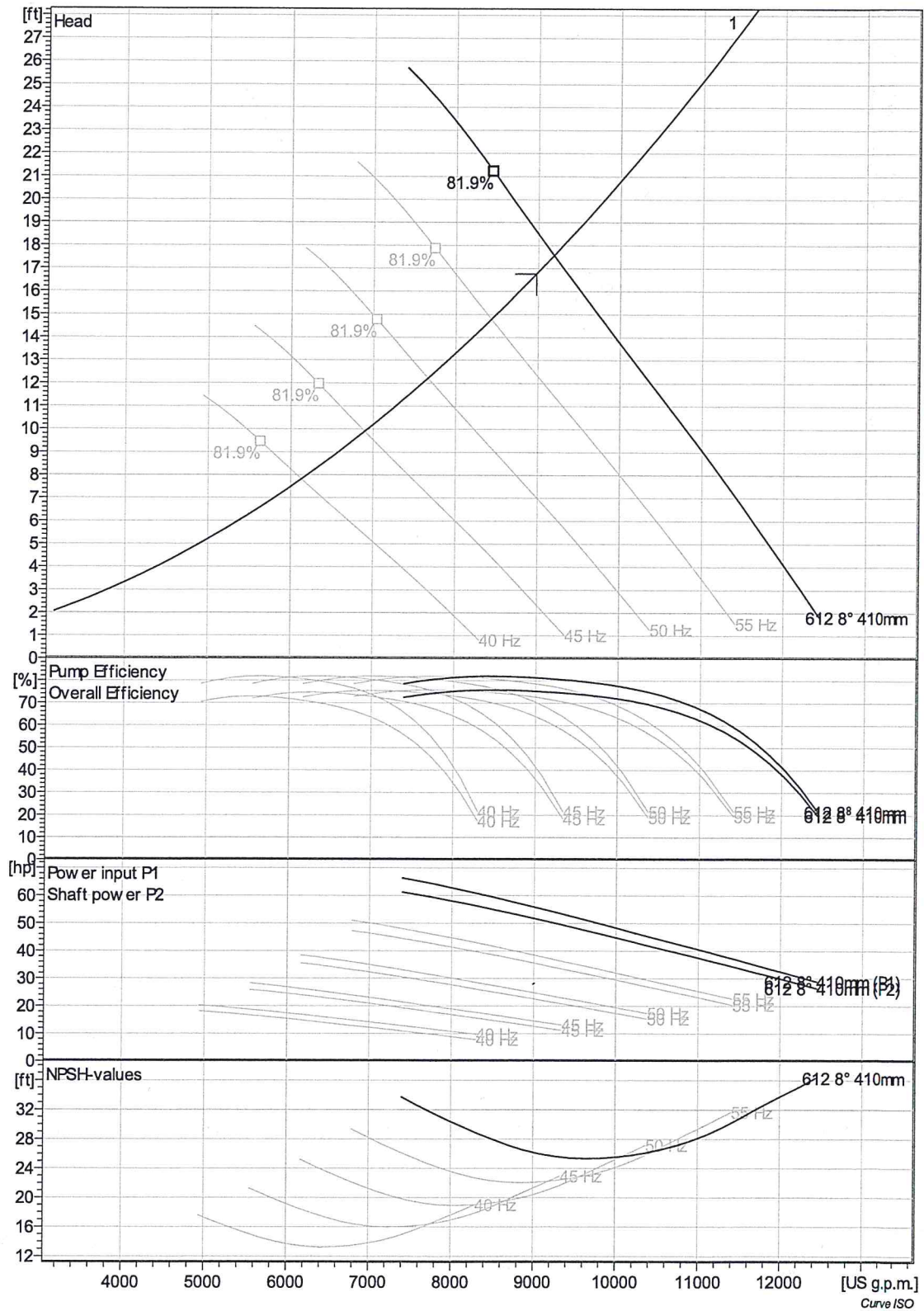
PL 7040 ** 3~ 612 VFD Analysis



Pumps running /System	Frequency	Flow	Head	Shaft power	Flow	Head	Shaft power	Hyd. eff.	Specific energy	NPSHre
1	60 Hz	9190 US g.p.m.	17.6 ft	50.5 hp	9190 US g.p.m.	17.6 ft	50.5 hp	80.8 %	73.8 kWh/US MG	25.7 ft
1	55 Hz	8430 US g.p.m.	14.8 ft	39 hp	8430 US g.p.m.	14.8 ft	39 hp	80.8 %	62.1 kWh/US MG	22.4 ft
1	50 Hz	7660 US g.p.m.	12.2 ft	29.3 hp	7660 US g.p.m.	12.2 ft	29.3 hp	80.8 %	51.7 kWh/US MG	19.3 ft
1	45 Hz									
1	40 Hz									

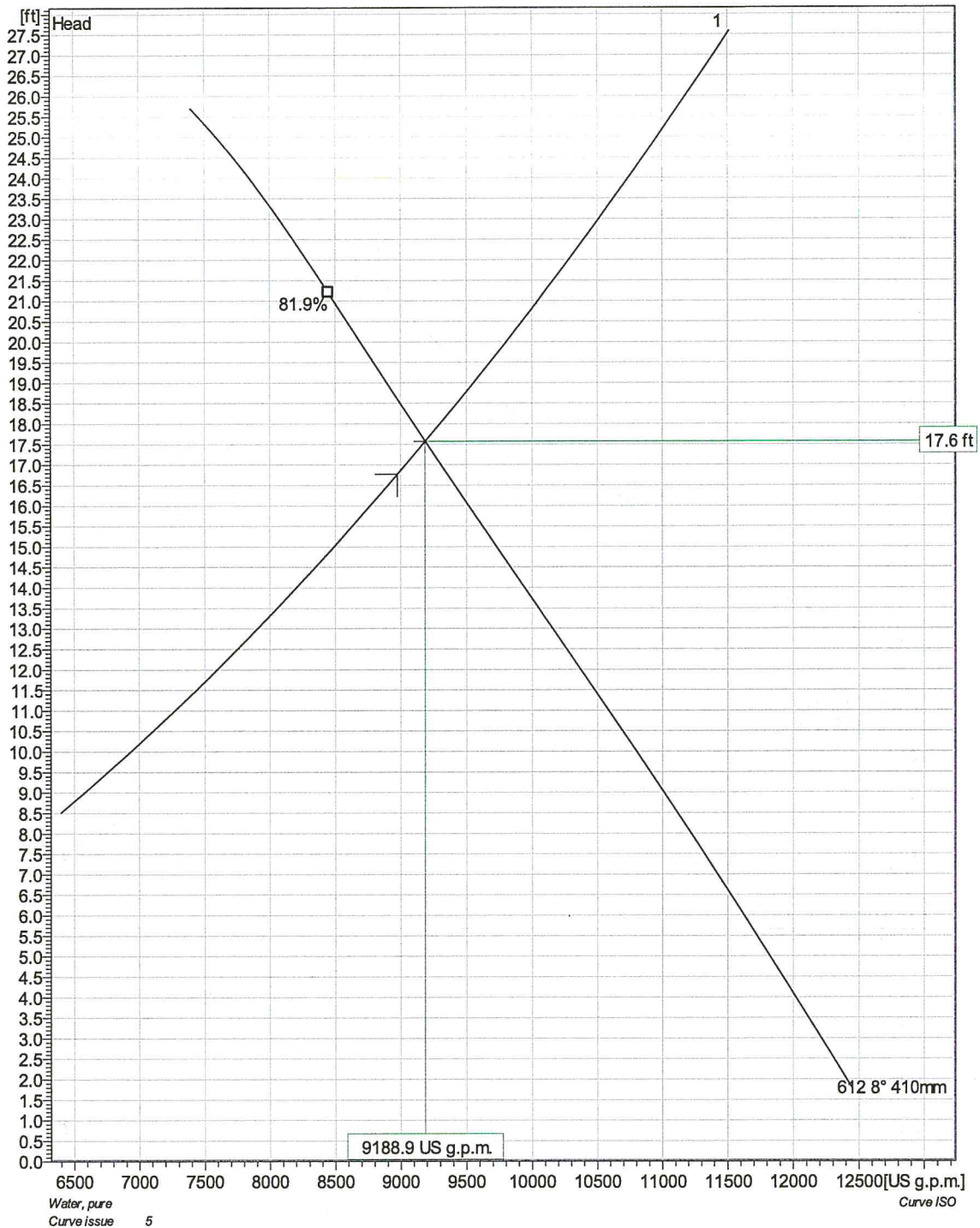
PL 7040 ** 3~ 612 VFD Curve

FLYGT



Project	Project ID	Created by	Created on 2017-01-19	Last update
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PL 7040 ** 3~ 612 Duty Analysis



Pumps running /System	Individual pump			Total					
	Flow	Head	Shaft power	Flow	Head	Shaft power	Pump eff.	Specific energy	NPSHre
1	9190 US g.p.m.	17.6 ft	50.5 hp	9190 US g.p.m.	17.6 ft	50.5 hp	80.8 %	73.8 kWh/US MG	25.7 ft

Project	Project ID	Created by	Created on	Last update
			2017-01-19	

PL 7040 ** 3~ 612

Performance curve



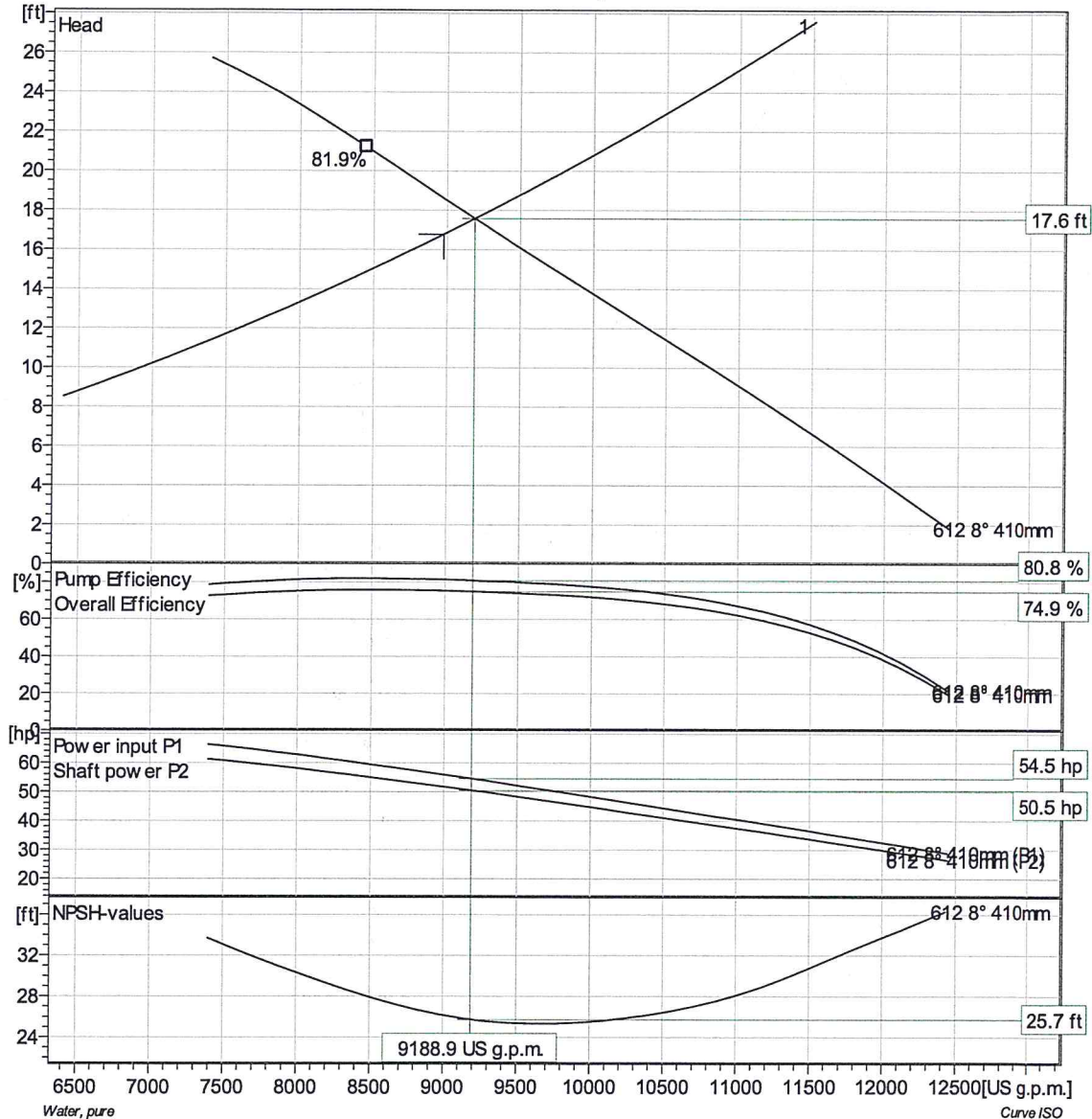
Pump

Column diameter 23 5/8 inch
Inlet diameter 16 1/8"
Impeller diameter 3
Number of blades 3

Motor

Motor # P7040.180 35-25-6AA-W 80hp
Approval Standard
Stator variant 1
Frequency 60 Hz
Rated voltage 460 V
Number of poles 6
Phases 3~
Rated power 80 hp
Rated current 99 A
Starting current 560 A
Rated speed 1180 rpm

Power factor
1/1 Load 0.83
3/4 Load 0.79
1/2 Load 0.70
Motor efficiency
1/1 Load 91.0 %
3/4 Load 92.0 %
1/2 Load 92.5 %

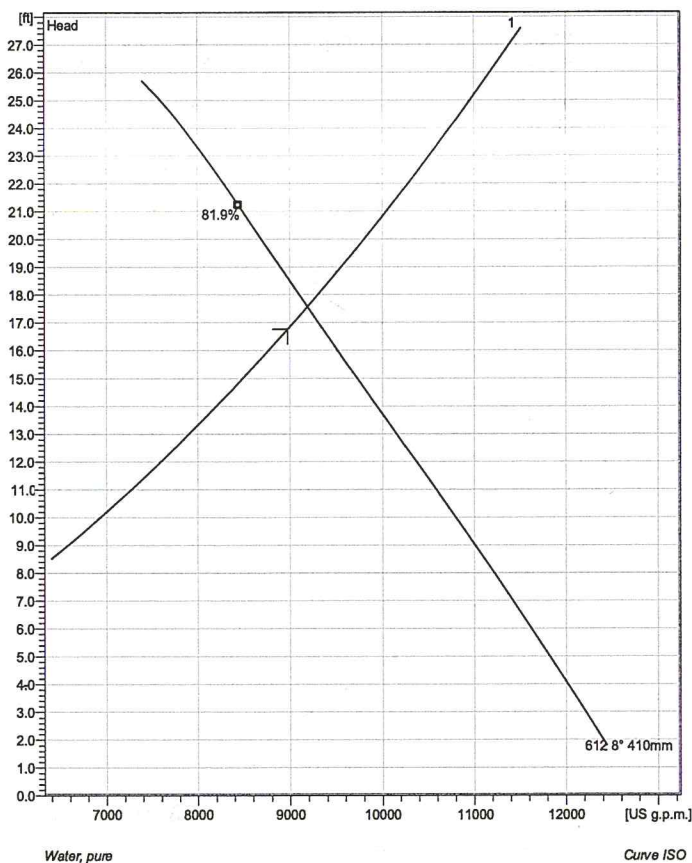


Duty point
Flow 8980 US g.p.m. Head 16.8 ft
Guarantee
ISO_9906_Grade No

Project	Project ID	Created by	Created on	Last update
			2017-01-19	

PL 7040 ** 3~ 612

Technical specification



Note: Picture might not correspond to the current configuration.

General

Axial flow propeller pumps with fixed or adjustable pitch blades for high capacity low head pumping of clean or slightly contaminated liquids. Cast iron design optimized for high-flow efficiency.

Impeller

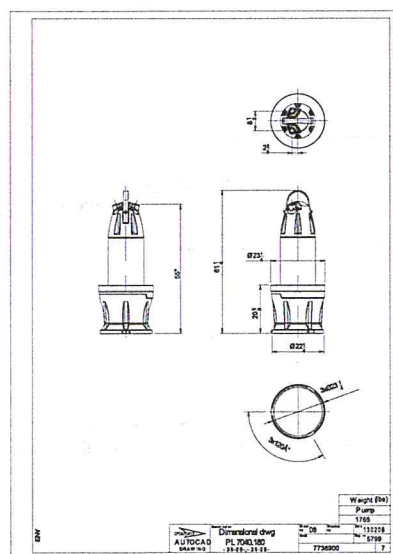
Impeller material	Stainless steel
Column diameter	23 5/8 inch
Inlet diameter	
Impeller diameter	410 mm
Number of blades	3

Motor

Motor #	P7040.180 35-25-6AA-W 80hp
Approval	Standard
Stator variant	1
Frequency	60 Hz
Rated voltage	460 V
Number of poles	6
Phases	3~
Rated power	80 hp
Rated current	99 A
Starting current	560 A
Rated speed	1180 rpm
Power factor	
1/1 Load	0.83
3/4 Load	0.79
1/2 Load	0.70
Motor efficiency	
1/1 Load	91.0 %
3/4 Load	92.0 %
1/2 Load	92.5 %

Configuration

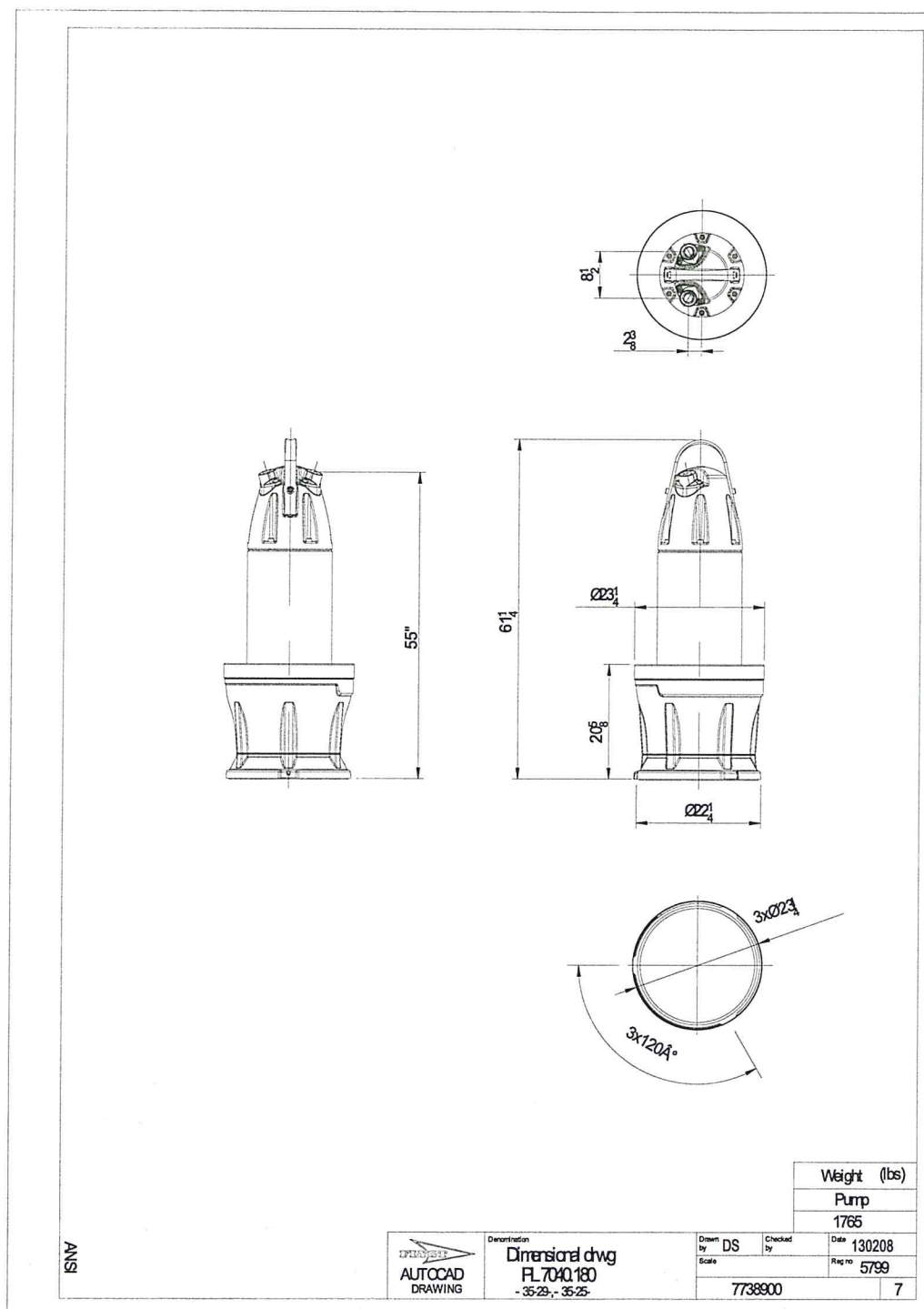
Installation: L - Column pipe Semi permanent, Wet



Project	Project ID	Created by	Created on	Last update
			2017-01-19	

PL 7040 ** 3~ 644

Dimensional drawing



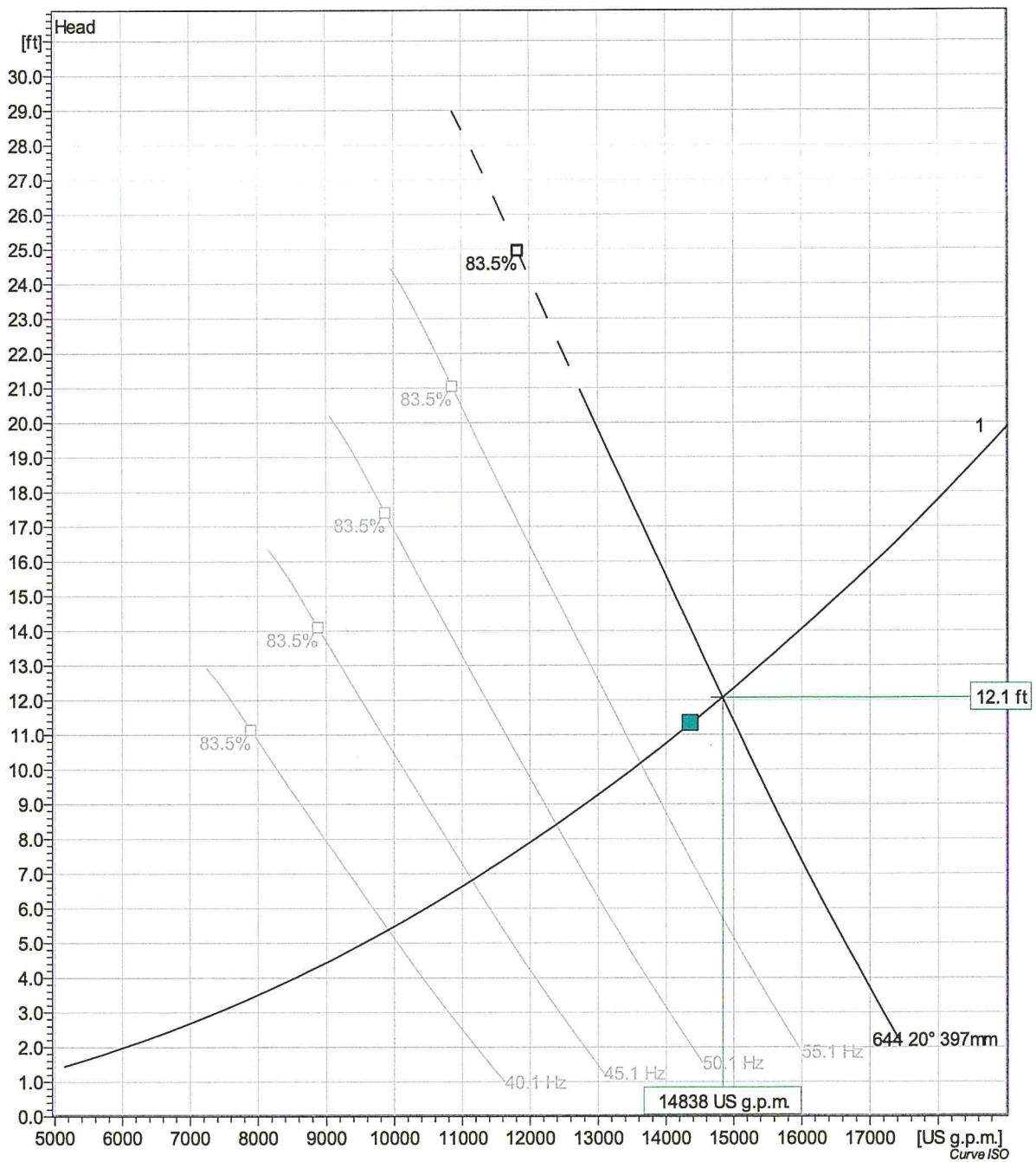
Project

Project ID

Created by

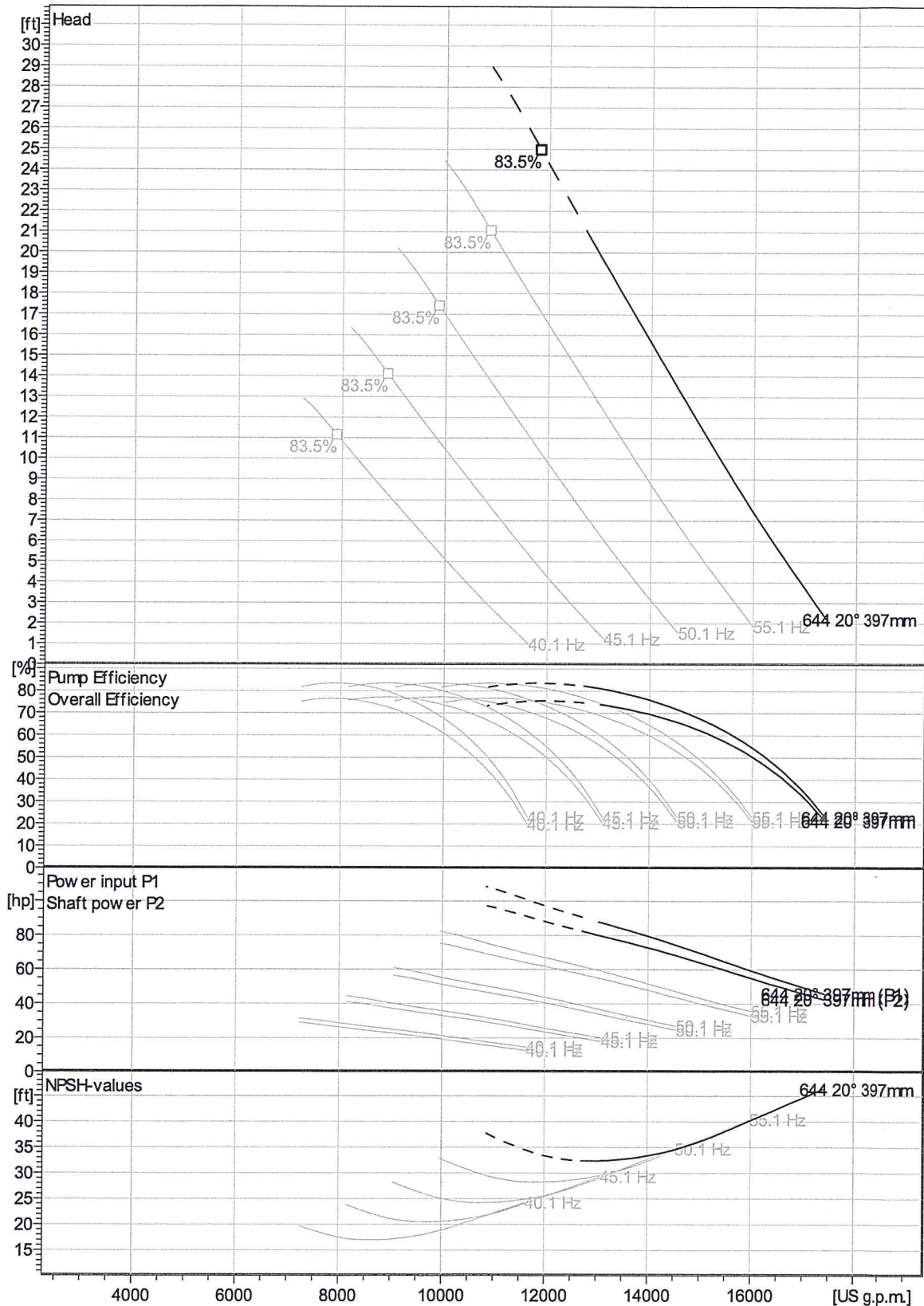
Created on
2017-01-24

Last update

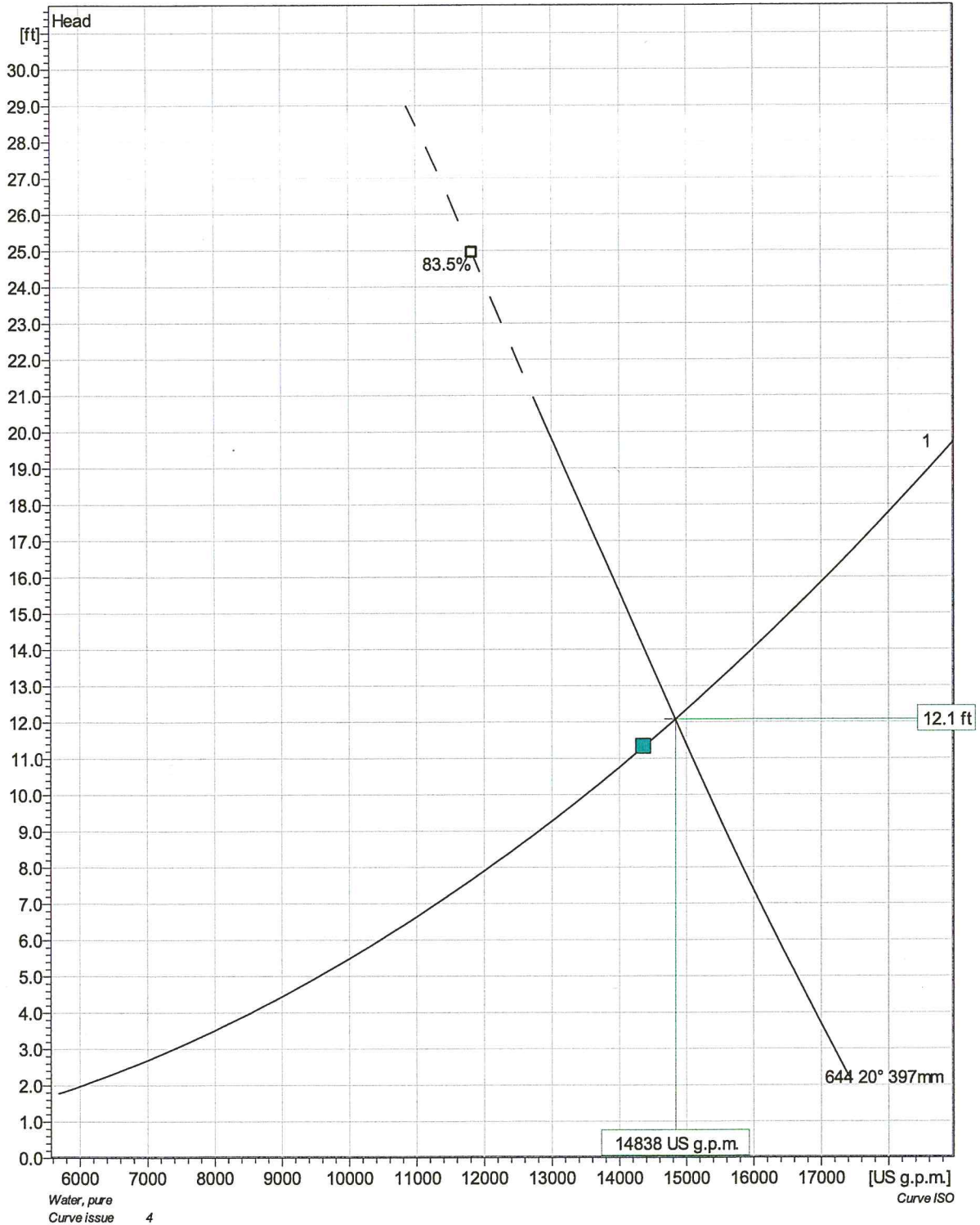


Pumps running /System	Pump 1								Specific energy		NPSH _r
	Frequency	Flow	Head	Shaft power	Flow	Head	Shaft power	Hyd. eff.			
1	60 Hz	14800 US g.p.m.	12.1 ft	65.7 hp	14800 US g.p.m.	12.1 ft	65.7 hp	69 %	59.8 kWh/US MG	35.5 ft	
1	55.1 Hz	13600 US g.p.m.	10.2 ft	50.8 hp	13600 US g.p.m.	10.2 ft	50.8 hp	69 %	50.1 kWh/US MG	31 ft	
1	50.1 Hz	12400 US g.p.m.	8.4 ft	38.2 hp	12400 US g.p.m.	8.4 ft	38.2 hp	69 %	41.4 kWh/US MG	26.5 ft	
1	45.1 Hz	11100 US g.p.m.	6.8 ft	27.8 hp	11100 US g.p.m.	6.8 ft	27.8 hp	69 %	33.8 kWh/US MG	22.5 ft	
1	40.1 Hz	9910 US g.p.m.	5.38 ft	19.6 hp	9910 US g.p.m.	5.38 ft	19.6 hp	69 %	27.2 kWh/US MG	18.6 ft	

PL 7040 ** 3~ 644 VFD Curve



PL 7040 ** 3~ 644 Duty Analysis



Pumps running /System	Individual pump			Total					
	Flow	Head	Shaft power	Flow	Head	Shaft power	Pump eff.	Specific energy	NPSHre
1	14800 US g.p.m.	12.1 ft	65.7 hp	14800 US g.p.m.	12.1 ft	65.7 hp	69 %	59.8 kWh/US MG	35.5 ft

Project	Project ID	Created by	Created on	Last update
			2017-01-24	

PL 7040 ** 3~ 644

Performance curve



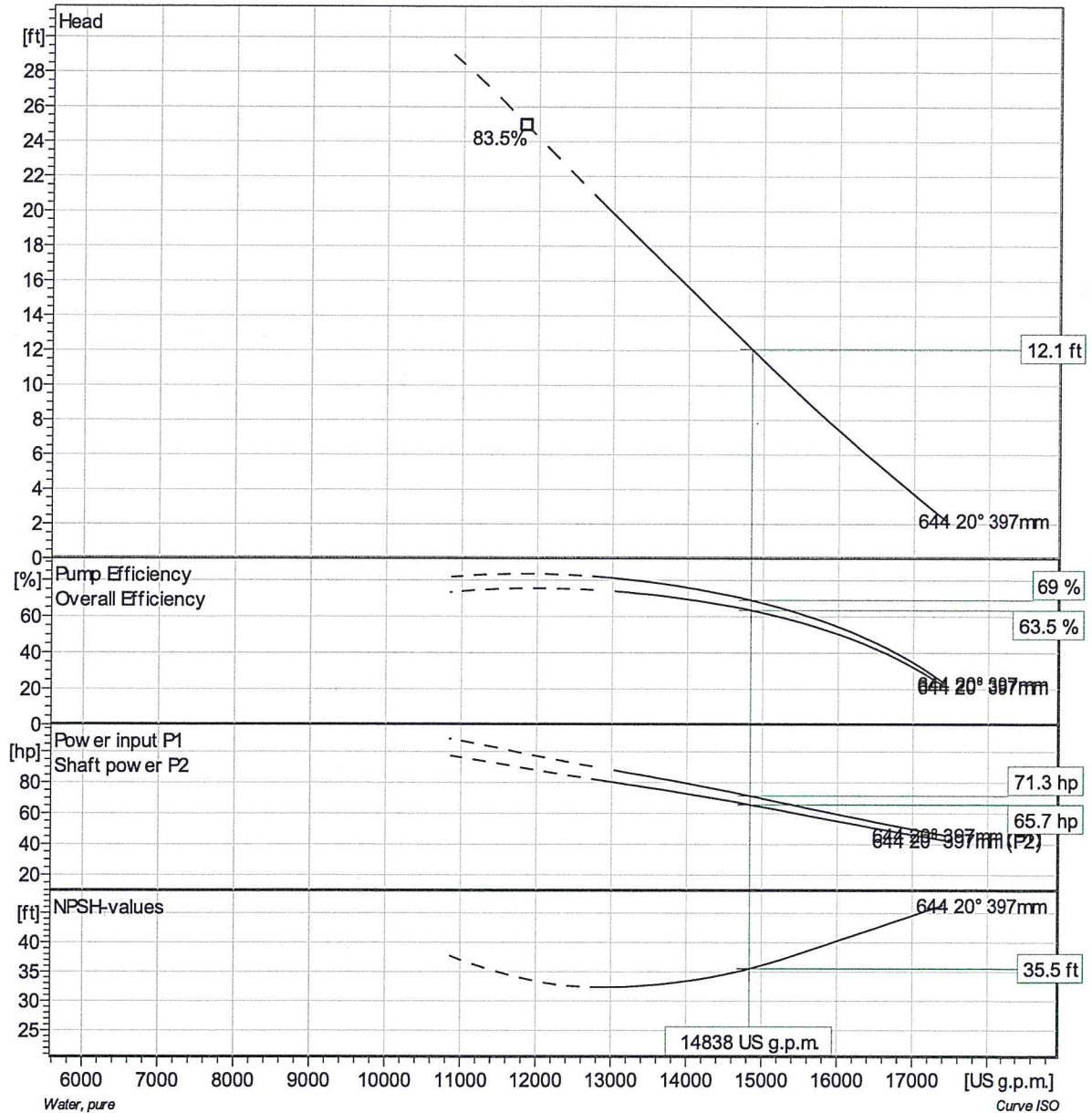
Pump

Column diameter 23 5/8 inch
Inlet diameter
Impeller diameter 15 5/8"
Number of blades 3

Motor

Motor # P7040.180 35-25-6AA-W 80hp
Approval Standard
Stator variant 1
Frequency 60 Hz
Rated voltage 460 V
Number of poles 6
Phases 3~
Rated power 80 hp
Rated current 99 A
Starting current 560 A
Rated speed 1180 rpm

Power factor
1/1 Load 0.83
3/4 Load 0.79
1/2 Load 0.70
Motor efficiency
1/1 Load 91.0 %
3/4 Load 92.0 %
1/2 Load 92.5 %

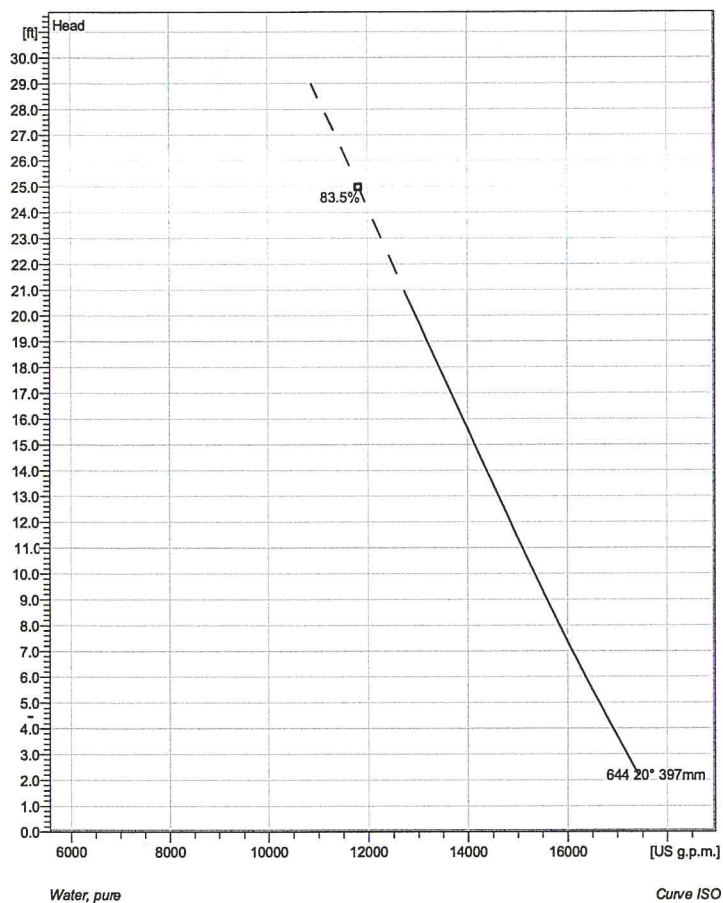


Duty point	Guarantee
Flow Head	ISO_9906_Grad@Grade
14400 US g.p.m. 11.3 ft	No

Project	Project ID	Created by	Created on	Last update
			2017-01-24	

PL 7040 ** 3~ 644

Technical specification



Note: Picture might not correspond to the current configuration.

General

Axial flow propeller pumps with fixed or adjustable pitch blades for high capacity low head pumping of clean or slightly contaminated liquids. Cast iron design optimized for high-flow efficiency.

Impeller

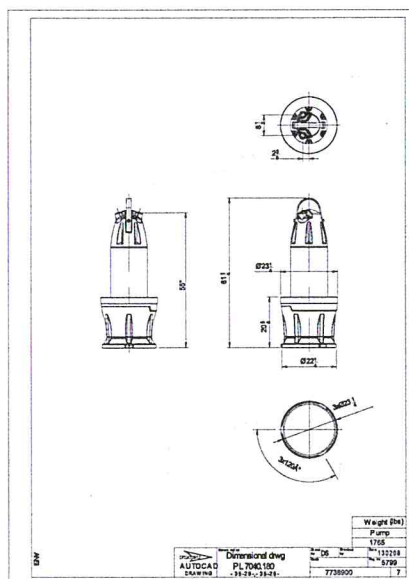
Impeller material	Stainless steel
Column diameter	23 5/8 inch
Inlet diameter	
Impeller diameter	397 mm
Number of blades	3

Motor

Motor #	P7040.180 35-25-6AA-W 80hp
Approval	Standard
Stator variant	1
Frequency	60 Hz
Rated voltage	460 V
Number of poles	6
Phases	3~
Rated power	80 hp
Rated current	99 A
Starting current	560 A
Rated speed	1180 rpm
Power factor	
1/1 Load	0.83
3/4 Load	0.79
1/2 Load	0.70
Motor efficiency	
1/1 Load	91.0 %
3/4 Load	92.0 %
1/2 Load	92.5 %

Configuration

Installation: L - Column pipe Semi permanent, Wet



Project

Project ID

Created by

Created on
2017-01-24

Last update

C4.4 Generator Set

Electric Power



Image shown may not reflect actual configuration

Caterpillar is leading the power generation marketplace with Power Solutions engineered to deliver unmatched flexibility, expandability, reliability, and cost-effectiveness.

Specifications

Generator Set Specifications	
Rating	40 ekW (50 kVA)
Voltage	480 Volts
Frequency	60 Hz
Speed	1800 rpm

Generator Set Configurations	
Emissions/Fuel Strategy	U.S. EPA Certified for Stationary Emergency Application (Meets nonroad U.S. EPA Tier 3 equivalent emission standards)

Engine Specifications		
Engine Model	C4.4 In-line 4, 4-cycle diesel	
Bore	105.0 mm	4.13 in
Displacement	4.4 L	268.5 in ³
Stroke	127.0 mm	5.0 in
Compression Ratio	18.2:1	
Aspiration	Turbocharged	
Governor Type	Electronic (adjustable)	
Fuel System	Common Rail	

Package Dimensions*		
Length	1972 mm	77.6 in
Width	1000 mm	39.4 in
Height	1175 mm	46.3 in
Weight†	861 kg	1898 lb

*Note: For reference only – do not use for installation design. Please contact your local dealer for exact weight and dimensions.

†Weight includes: Oversize generator, skid base, circuit breaker, oil, and coolant.



Benefits & Features

Cat® Diesel Engine

- Reliable, rugged, durable design
- Field-proven in thousands of applications worldwide
- Four-stroke cycle diesel engine combines consistent performance and excellent fuel economy with minimum weight
- Electronic engine control

Generator

- Matched to the performance and output characteristics of Cat engines
- Industry-leading mechanical and electrical design
- Industry-leading motor starting capabilities
- High efficiency

Cat EMCP Control Panel

The EMCP controller features the reliability and durability you have come to expect from your Cat equipment. EMCP 4 is a scalable control platform designed to ensure reliable generator set operation, providing extensive information about power output and engine operation. EMCP 4 systems can be further customized to meet your needs through programming and expansion modules.

Seismic Certification

- Seismic certification available
- Anchoring details are site specific, and are dependent on many factors such as generator set size, weight, and concrete strength
- IBC certification requires that the anchoring system used is reviewed and approved by a professional engineer
- Seismic certification per applicable building codes: IBC 2006, IBC 2009, IBC 2012, IBC 2015

Design Criteria

- The generator set accepts 100% rated load in one step per NFPA 110 and meets ISO 8528-5 transient response
- Cooling system designed to operate in 50°C/122°F ambient temperatures with an air flow restriction of 0.5 in. water

UL 2200/CSA – Optional

- UL 2200 Listed
 - CSA Certified
- Certain restrictions may apply. Consult with your Cat dealer.

Single-Source Supplier

Fully prototype tested with certified torsional vibration analysis.

Worldwide Product Support

Cat dealers provide extensive post-sale support including maintenance and repair agreements. Cat dealers have over 1,800 dealer branch stores operating in 200 countries. The Cat S•O•SSM program cost effectively detects internal engine component condition, even the presence of unwanted fluids and combustion by-products.

Standard Equipment

Air Inlet

- Dry replaceable paper element type with restriction indicator

Cooling

- Radiator and cooling fan complete with protective guards
- Standard ambient temperatures up to 50°C (122°F)

Exhaust

- Exhaust flange outlet

Fuel

- Primary and secondary fuel filters
- Fuel priming pump
- Flexible fuel lines

Generator

- Matched to the performance and output characteristics of Cat engines
- Load adjustment module provides engine relief upon load impact and improves load acceptance and recovery time
- IP23 protection
- Integrated Voltage Regulation

Governor

- Electronic governor – ADEM™ A4

Control Panels

- EMCP 4.2 Series generator set controller

Mounting

- Rubber vibration isolators

Starting/Charging

- 12 volt starting motor
- Batteries with rack and cables

General

- Paint – Caterpillar Yellow except rails and radiators gloss black



Optional Equipment

Generator

- Excitation: [] Permanent Magnet Excited (PM) [] Internally Excited (IE)
- Oversize and premium generators

Starting/Charging

- Battery charger – UL 10 amp
- Battery disconnect switch
- Battery removal (does not remove rack and cables)
- Jacket water heater

General

- UL 2200
- CSA Certification
- Enclosures: sound attenuated, weather protective
- Integral or sub-base dual wall UL Listed fuel tanks
- Automatic transfer switches (ATS)

ELECTRIC POWER – Technical Spec Sheet STANDARD



C4.4

40 ekW/ 50 kVA/ 60 Hz/ 1800 rpm/ 480V/ 0.8 Power Factor

Rating Type: STANDBY

Emissions: U.S. EPA Certified for Stationary Emergency Application
(Meets nonroad U.S. EPA Tier 3 equivalent emission standards)



D40-2LC

40 ekW/ 50 kVA

60Hz/ 1800 rpm/ 480V

Image shown may not reflect actual configuration

Package Performance

Generator Set Power Rating with Fan @ 0.8 Power Factor	40 ekW
Generator Set Power Rating	50 kVA

Fuel Consumption

100% Load With Fan	13.9 L/hr	3.7 gal/hr
75% Load With Fan	10.8 L/hr	2.9 gal/hr
50% Load With Fan	8.1 L/hr	2.1 gal/hr

Cooling System¹

Engine Coolant Capacity	7.0 L	1.8 gal
Radiator Coolant Capacity	9.5 L	2.5 gal
Engine Coolant Capacity with Radiator/Exp Tank	16.5 L	4.4 gal
Air Flow Restriction (System)	0.12 kPa	0.48 in. water

Inlet Air

Combustion Air Inlet Flow Rate	5.3 m ³ /min	187.2 cfm
--------------------------------	-------------------------	-----------

Exhaust System

Exhaust Stack Gas Temperature	571°C	1060°F
Exhaust Gas Flow Rate	13.7 m ³ /min	483.8 cfm
Exhaust System Backpressure (maximum allowable)	15.0 kPa	60.2 in. water

ELECTRIC POWER – Technical Spec Sheet STANDARD



C4.4

40 ekW/ 50 kVA/ 60Hz/ 1800 rpm/ 480V/ 0.8 Power Factor

Rating Type: STANDBY

Emissions: U.S. EPA Certified for Stationary Emergency Application
(Meets nonroad U.S. EPA Tier 3 equivalent emission standards)

Heat Rejection		
Heat Rejection to Coolant (total)	46.1 kW	2622 Btu/min
Heat Rejection to Exhaust (total)	66.9 kW	3805 Btu/min
Heat Rejection to Atmosphere from Engine	14.9 kW	847.3 Btu/min
Heat Rejection to Atmosphere from Generator	4.7 kW	267.3 Btu/min

Alternator ²		
Motor Starting Capability @ 30% Voltage Dip	105 skVA	
Frame	LC1514J	
Temperature Rise	130°C	234°F
Excitation	Self Excited	

Lube System		
Sump Refill with Filter	8.4 L	2.2 gal

Emissions (Nominal) ³	
NOx + HC	4.42 g/kW-hr
CO	1.02 g/kW-hr
PM	0.26 g/kW-hr

¹ For ambient and altitude capabilities consult your Cat dealer. Air flow restriction (system) is added to the existing restriction from the factory.

² Generator temperature rise is based on a 40°C (104°F) ambient per NEMA MG1-32.

³ The nominal emissions data shown is subject to instrumentation, measurement, facility and engine to engine variations. Emissions data is based on 100% Prime load.

ELECTRIC POWER – Technical Spec Sheet STANDARD



C4.4

40 ekW/ 50 kVA/ 60Hz/ 1800 rpm/ 480V/ 0.8 Power Factor

Rating Type: **STANDBY**

Emissions: **U.S. EPA Certified for Stationary Emergency Application**
(Meets nonroad U.S. EPA Tier 3 equivalent emission standards)

DEFINITIONS AND CONDITIONS

Applicable Codes and Standards:

AS1359, CSA C22.2 No 100-04, UL142, UL489, UL601, UL869, UL2200, NFPA 37, NFPA 70, NFPA 99, NFPA 110, IBC, IEC60034-1, ISO3046, ISO8528, NEMA MG 1-22, NEMA MG 1-33, 72/23/EEC, 98/37/EC, 2004/108/EC.

STANDBY: Output available with varying load for the duration of the interruption of the normal source power. Average power output is 70% of the standby power rating. Typical operation is 200 hours per year, with maximum expected usage of 500 hours per year.

Ratings are based on SAE J1349 standard conditions. These ratings also apply at ISO3046 standard conditions.

Fuel Rates are based on fuel oil to specification EPA 2D 89.330-96 with a density of 0.845 – 0.850 kg/L (7.052 – 7.094 lbs/U.S. gal.) @ 15°C (59°F) and fuel inlet temperature 40°C (104°F).

Additional ratings may be available for specific customer requirements, contact your Cat representative for details.

Performance No.: P3454C-00
Feature Code: NAC147P
Generator Arrangement: 4676043
Date: 09/12/2016
Source Country: U.S.

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The International System of Units (SI) is used in this publication.

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LEHE0872-01



Image shown may not reflect actual configuration

C4.4 LC Integral/Sub-base Fuel Tanks

Newberry
Diesel Generator Set
40-60 kW 60 Hz

Features

- UL Listed for United States (UL 142) and Canada (CAN/ULC S601)
- Facilitate compliance with NFPA 30 code, NFPA 37 and 110 standards and CSA C282 code and B139-09 standard
- Welded, heavy steel gauge construction with a containment basin sized as a minimum 110% of the tank
- Gloss black polyester triglycidyl isocyanurate (TGIC) powder coating
- Dedicated external customer interface area with access to the 4" (101.6 mm) fuel fill, visual level gauge, normal and emergency vents
- Rear electrical stub-up area with removable access panel
- Removable engine supply and return dip tubes
- Two additional 1" (25.4 mm) ports for customer use
- Tanks are rated to safely support the weight of the generator
- Standard NPT tank fittings
- UL listed emergency vents sized as per UL standards 3" (76.2 mm) NPT
- Normal atmospheric vent 1-1/4" (31.75 mm)
- Top-mounted fuel level sensor with control panel alarms
- Top-mounted leak detection switch
- Lockable fuel fill cap, 4" (101.6 mm) NPT

Description

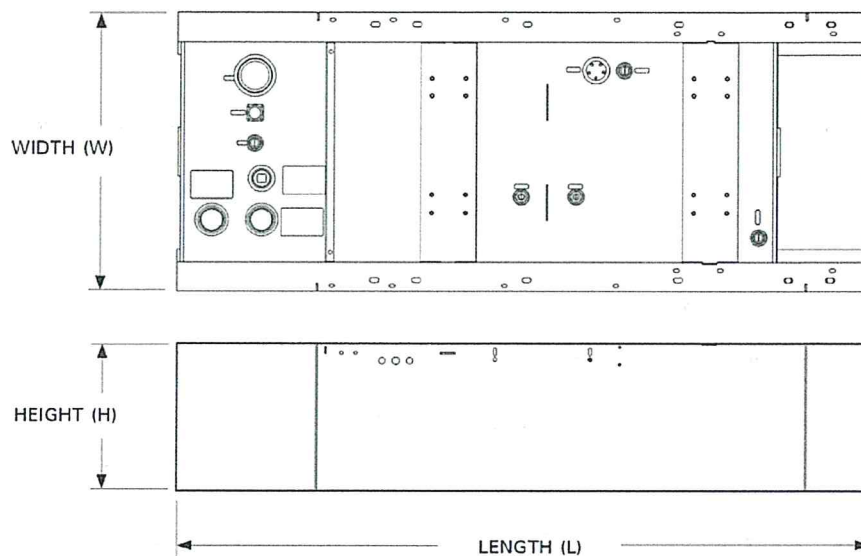
- Dual wall, secondary containment
- Pressure tested to UL requirements
- Fuel tank mounts directly below generator skid base
- Sub-base fuel tank mounts directly below generator skid base
- Integral fuel tank is incorporated into the generator set base frame including linear vibration isolators between tank base, engine, and generator
- Modular tank design is compatible with all factory units open and enclosed

Options

- Emergency vent and normal vent extension kits 12' (3.66 m)
- 5 gal (18.9 L) spill containment
- Overfill prevention valve
- Tank riser to allow for visual secondary containment leak inspection
- Drop tube

C4.4 LC Sub-base Fuel Tank Dimensions and Capacities

Engine Model	Tank Feature Code	Generator Set Rating kW	Est. Run Time hrs	Fillable Capacity		Usable Capacity		Vent	Length 'L'		Width 'W'		Height 'H'		Weight (Dry)	
				L	gal	L	gal		in	mm	in	mm	in	mm	in	kg
C4.4	INTFT140 SBT140	40	36	520	137	508	134	3	2483	97.8	1000	39.4	533	21.0	336	740
		50	29													
		60	26													
	INTFT250 SBT250	40	68	965	255	952	251	3					864	34.0	466	1027
		50	55													
		60	49													



Note: For reference only – do not use for installation design. Please contact your local dealer for exact dimensions.

Tanks are UL Listed and constructed in accordance with UL Standard for Safety UL 142, Steel Aboveground Tanks for Flammable and Combustible Liquids and Canada CAN/ULC S601, Standard for Shop Fabricated Steel Aboveground Horizontal Tanks for Flammable and Combustible Liquids.

Fuel tanks facilitate compliance with the following United States NFPA Code and Standards:

- NFPA 30: Flammable and Combustible Liquids Code
- NFPA 37: Standard for the Installation and Use of Stationary Combustion Engines and Gas Turbines
- NFPA 110: Standard for Emergency and Standby Power Systems

Fuel tanks facilitate compliance with the following Canadian Standard and Code:

- CSA C282 – Emergency Electrical Power Supply for Buildings
- CSA B139-09 – Installation Code for Oil-Burning Equipment

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Weather Protective and Sound Attenuated Enclosures D40-2LC to D60-4LC

Picture shown may not represent actual package

Features

Highly Corrosion Resistant construction

- Stainless steel flush fitting latches and hinges tested and proven to withstand extreme conditions of corrosion
- Zinc plated or stainless steel fasteners
- Body constructed from 16 gauge steel components treated with polyester powder coating

Excellent Access

- Single side access for service and controls
- Over head door with lift assist strut on service side
- All non-service sides have removable doors and/or panels
- Radiator fill access
- Lube oil and coolant drains piped to the exterior of the enclosure base
- Large cable entry area for installation ease

Transportability

- These enclosures are of extremely rugged construction to withstand outdoor exposure and rough handling common on many construction sites.
- This range of enclosures are designed on modular principles which will aid on site repair

Security and Safety

- Lockable access doors which give full access to control panel and breaker
- Cooling fan and battery charging alternator fully guarded
- Fuel fill, oil fill, and battery can only be reached via lockable access
- Stub-up area is rodent proof
- Externally mounted emergency stop button

Options

- Weather Protective Enclosure
- Sound Attenuated Enclosure – Weather protective with critical silencer
- Cat Yellow or white paint
- UL Listed fuel tanks

Enclosure Sound Pressure Levels (SPL) at 100%

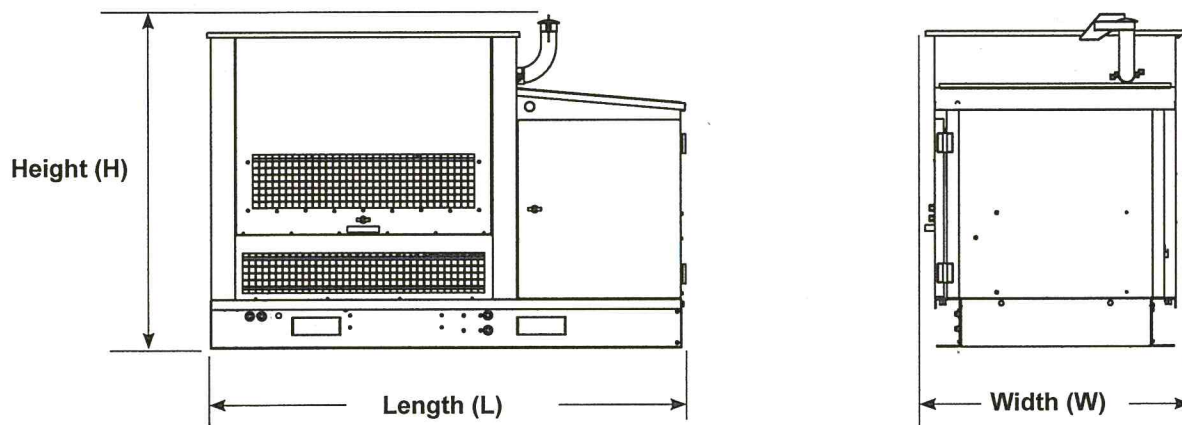
Sound Attenuated Enclosure		Cooling Air Flow Rate		SPL @ 7m (23ft)
Model	Standby eKW	m³/s	cfm	dBA
D40-2LC	40	1.7	3602	74
D50-2LC	50	1.7	3602	74
D60-4LC	60	1.9	4026	74

Weather Protective Enclosure		Cooling Air Flow Rate		SPL @ 7m (23ft)
Model	Standby eKW	m³/s	cfm	dBA
D40-2LC	40	1.7	3602	85
D50-2LC	50	1.7	3602	86
D60-4LC	60	1.9	4026	88

Component Weights to Calculate Package Weight

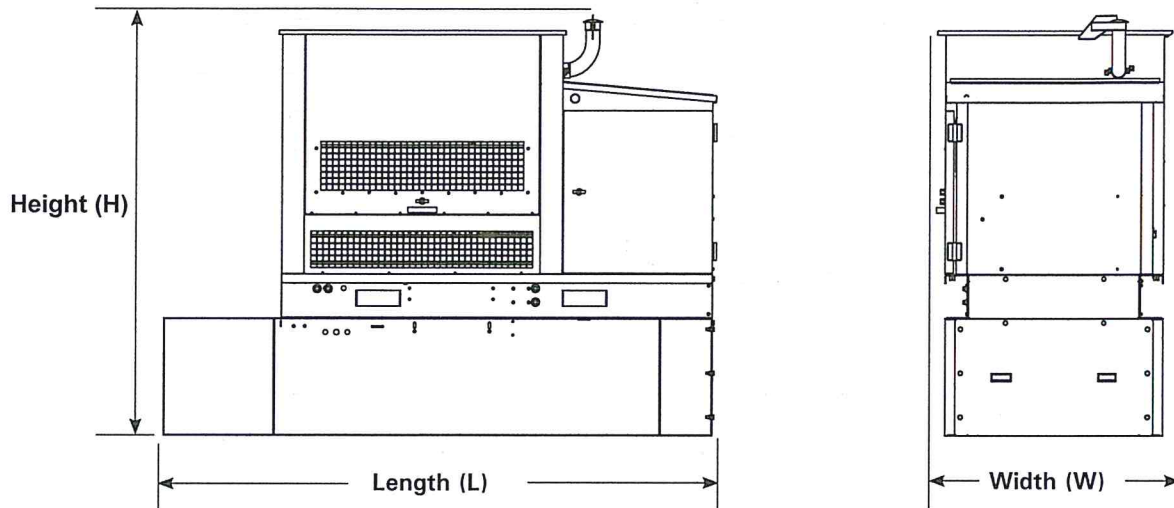
Model	Standby eKW	Skid Base		Weather Protective Enclosure		Sound Attenuated Enclosure	
		kg	lb	kg	lb	kg	lb
D40-2LC	40	80	176	121	267	137	302
D50-2LC	50						
D60-4LC	60						

Enclosure Dimensions on Skid Bases



Engine Model	Generator Set Rating ekW	Enclosure	Width 'W'		Length 'L'		Height 'H'	
			mm	in	mm	in	mm	in
C4.4	40	Weather Protective/ Sound Attenuated	1075	42.3	1972	77.6	1378	54.3
	50							
	60							

Enclosure Dimensions on UL Listed Sub Base Tanks

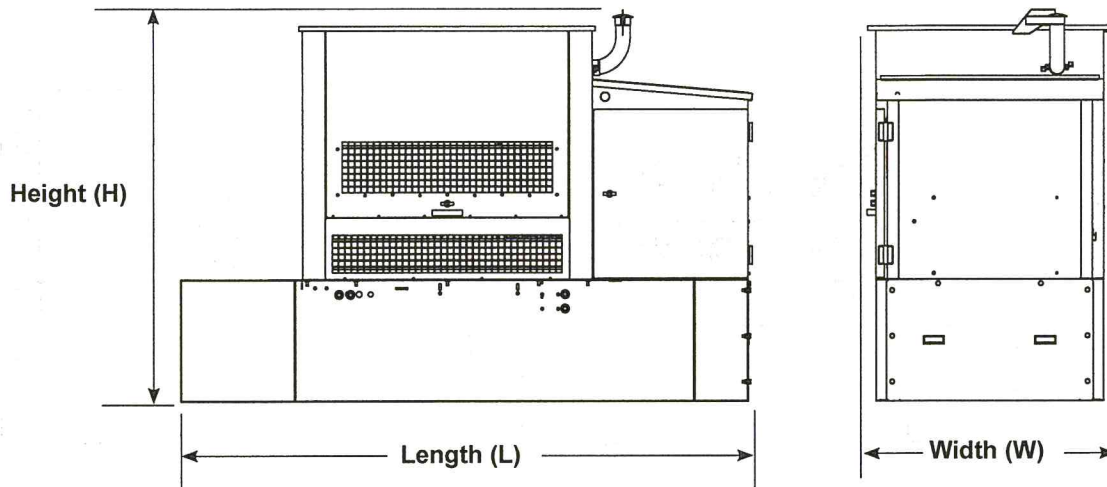


Engine Model	Generator Set Rating ekW	Enclosure	137 Gallon Sub Base Tank				255 Gallon Sub Base Tank			
			Length 'L'		Height 'H'		Length 'L'		Height 'H'	
			mm	in	mm	in	mm	in	mm	in
C4.4	40	Weather Protective/ Sound Attenuated	2503	98.5	1912	75.3	2503	98.5	2241	88.2
	50									
	60									

ENCLOSURES



Enclosure Dimensions on UL Listed Integral Tanks



Engine Model	Generator Set Rating kW	Enclosure	137 Gallon Integral Tank				255 Gallon Integral Tank			
			Length 'L'		Height 'H'		Length 'L'		Height 'H'	
			mm	in	mm	in	mm	in	mm	in
C4.4	40	Weather Protective/ Sound Attenuated	2503	98.5	1712	67.4	2503	98.5	2041	80.4
	50									
	60									

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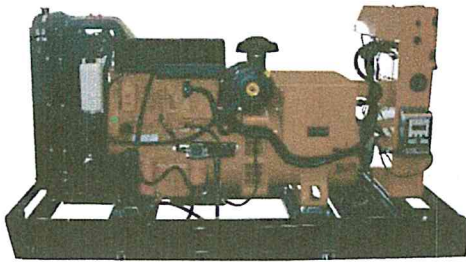
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C4.4 Generator Set

Electric Power



Caterpillar is leading the power generation marketplace with Power Solutions engineered to deliver unmatched flexibility, expandability, reliability, and cost-effectiveness.

Image shown may not reflect actual configuration

Specifications

Generator Set Specifications	
Rating	100 ekW (125 kVA)
Voltage	480 Volts
Frequency	60 Hz
Speed	1800 rpm

Generator Set Configurations	
Emissions/Fuel Strategy	U.S. EPA Certified for Stationary Emergency Application (Tier 3 Nonroad Equivalent Emission Standards)

Engine Specifications		
Engine Model	C4.4 Vertical In-line 4, 4-cycle diesel	
Bore	105.0 mm	4.13 in
Displacement	4.4 L	268.5 in ³
Stroke	127.0 mm	5.0 in
Compression Ratio	16.7:1	
Aspiration	Turbocharged Air-to-Air Aftercooled	
Governor Type	Electronic	
Fuel System	Common Rail	

Package Dimensions*		
Length	2362 mm	93 in
Width	1110 mm	44 in
Height	1304 mm	51 in
Weight†	1166 kg	2570 lb

*Note: For reference only – do not use for installation design. Please contact your local dealer for exact weight and dimensions.

†Weight includes: Oversize generator, skid base, circuit breaker, oil, and coolant.

C4.4 Generator Set

Electric Power

Benefits & Features

Cat® Diesel Engine

- Reliable, rugged, durable design
- Field-proven in thousands of applications worldwide
- Four-stroke cycle diesel engine combines consistent performance and excellent fuel economy with minimum weight
- Electronic engine control

Generator

- Matched to the performance and output characteristics of Cat engines
- Industry-leading mechanical and electrical design
- Industry-leading motor starting capabilities
- High efficiency

Cat EMCP Control Panel

The EMCP controller features the reliability and durability you have come to expect from your Cat equipment. EMCP 4 is a scalable control platform designed to ensure reliable generator set operation, providing extensive information about power output and engine operation. EMCP 4 systems can be further customized to meet your needs through programming and expansion modules.

Seismic Certification

- Seismic certification available
- Anchoring details are site specific, and are dependent on many factors such as generator set size, weight, and concrete strength
- IBC certification requires that the anchoring system used is reviewed and approved by a professional engineer
- Seismic certification per applicable building codes: IBC 2006, IBC 2009, IBC 2012, IBC 2015

Design Criteria

- The generator set accepts 100% rated load in one step per NFPA 110 and meets ISO 8528-5 transient response
- Cooling system designed to operate in 50°C/122°F ambient temperatures with an air flow restriction of 0.5 in. water

UL 2200/CSA – Optional

- UL 2200 Listed
- CSA Certified

Certain restrictions may apply. Consult with your Cat dealer.

Single-Source Supplier

Fully prototype tested with certified torsional vibration analysis.

Worldwide Product Support

Cat dealers provide extensive post-sale support including maintenance and repair agreements. Cat dealers have over 1,800 dealer branch stores operating in 200 countries. The Caterpillar S•O•SSM program cost effectively detects internal engine component condition, even the presence of unwanted fluids and combustion by-products.

C4.4 Generator Set

Electric Power

Standard Equipment

Air Inlet

- Single element Air filter

Cooling

- Radiator and cooling fan complete with protective guards
- Standard ambient temperatures up to 50°C (122°F)

Exhaust

- Exhaust flange outlet

Fuel

- Primary and secondary fuel filters
- Fuel priming pump
- Flexible fuel lines

Generator

- Matched to the performance and output characteristics of Cat engines
- Load adjustment module provides engine relief upon load impact and improves load acceptance and recovery time
- IP23 protection
- Integrated Voltage Regulation

Governor

- Electronic governor – ADEM™ A4

Control Panels

- EMCP 4.2 Series generator set controller

Mounting

- Rubber vibration isolators

Starting/Charging

- 12 volt starting motor
- Battery with rack and cables

General

- Paint – Caterpillar Yellow except rails and radiators gloss black

C4.4 Generator Set

Electric Power

Optional Equipment

Exhaust

- Industrial, residential, critical mufflers

Generator

- Excitation: ☐ Permanent Magnet Excited (PM) ☐ Internally Excited (IE)
- Anti-condensation heaters
- Oversize and premium generators

Starting/Charging

- Battery charger – UL 10 amp
- Battery disconnect switch
- Jacket water heater

General

- UL 2200
- CSA Certification
- Enclosures: sound attenuated, weather protective
- Sub-base dual wall UL Listed fuel tanks
- Automatic transfer switches (ATS)

ELECTRIC POWER – Technical Spec Sheet STANDARD

C4.4

100 ekW/ 125 kVA/ 60 Hz/ 1800 rpm/ 480V/ 0.8 Power Factor

Rating Type: STANDBY

Emissions: U.S. EPA Certified for Stationary Emergency Application
(Tier 3 Nonroad Equivalent Emission Standards)

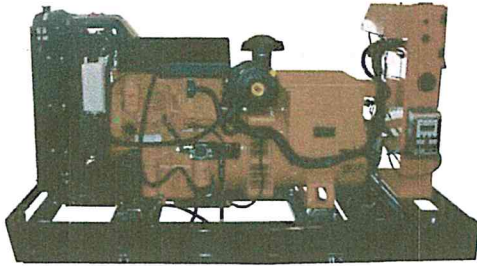


Image shown may not reflect actual configuration

D100-8

100 ekW/ 125 kVA
60Hz/ 1800 rpm/ 480V

Package Performance	
Generator Set Power Rating with Fan @ 0.8 Power Factor	100 ekW
Generator Set Power Rating	125 kVA

Fuel Consumption		
100% Load With Fan	28.8 L/hr	7.6 gal/hr
75% Load With Fan	23.2 L/hr	6.1 gal/hr
50% Load With Fan	17.2 L/hr	4.5 gal/hr

Cooling System ¹		
Engine Coolant Capacity	7.0 L	1.8 gal
Radiator Coolant Capacity	10.0 L	2.6 gal
Engine Coolant Capacity with Radiator/Exp Tank	17.0 L	4.5 gal
Air Flow Restriction (System)	0.12 kPa	0.48 in. water

Inlet Air		
Combustion Air Inlet Flow Rate	8.82 m ³ /min	311 cfm

Exhaust System		
Exhaust Stack Gas Temperature	659°C	1218°F
Exhaust Gas Flow Rate	20.2 m ³ /min	712 cfm
Exhaust System Backpressure (maximum allowable)	15.0 kPa	60.2 in. water
Exhaust Flange Size (internal diameter)	64.0 mm	2.5 in

ELECTRIC POWER – Technical Spec Sheet

STANDARD

C4.4

100 ekW/ 125 kVA/ 60 Hz/ 1800 rpm/ 480V/ 0.8 Power Factor

Rating Type: **STANDBY**

Emissions: **U.S. EPA Certified for Stationary Emergency Application**
(Tier 3 Nonroad Equivalent Emission Standards)

Heat Rejection		
Heat Rejection to Coolant (total)	54.9 kW	3122 Btu/min
Heat Rejection to Exhaust (total)	91.3 kW	5192 Btu/min
Heat Rejection to Atmosphere from Engine	15.6 kW	887 Btu/min
Heat Rejection to Atmosphere from Generator	8.3 kW	472 Btu/min

Alternator ²		
Motor Starting Capability @ 30% Voltage Dip	215 skVA	
Frame	LC3114D	
Temperature Rise	150°C	270°F
Excitation	Self Excited	

Lube System		
Sump Refill with Filter	8.4 L	2.2 gal

Emissions (Nominal) ³	
NOx + HC	3.6 g/kW-hr
CO	0.9 g/kW-hr
PM	0.12 g/kW-hr

¹For ambient and altitude capabilities consult your Cat dealer. Air flow restriction (system) is added to the existing restriction from the factory.

²Generator temperature rise is based on a 40°C (104°F) ambient per NEMA MG1-32.

³The nominal emissions data shown is subject to instrumentation, measurement, facility and engine to engine variations. Emissions data is based on 100% Prime load. This information should not be used for permitting purposes and is subject to change without notice. Contact your Cat dealer for further details.

ELECTRIC POWER – Technical Spec Sheet STANDARD

C4.4

100 ekW/ 125 kVA/ 60 Hz/ 1800 rpm/ 480V/ 0.8 Power Factor

Rating Type: **STANDBY**

Emissions: **U.S EPA Certified for Stationary Emergency Application
(Tier 3 Nonroad Equivalent Emission Standards)**

DEFINITIONS AND CONDITIONS

Applicable Codes and Standards:

AS1359, CSA C22.2 No 100-04, UL142, UL489, UL601, UL869, UL2200, NFPA 37, NFPA 70, NFPA 99, NFPA 110, IBC, IEC60034-1, ISO3046, ISO8528, NEMA MG 1-22, NEMA MG 1-33, 72/23/EEC, 98/37/EC, 2004/108/EC.

STANDBY: Output available with varying load for the duration of the interruption of the normal source power. Average power output is 70% of the standby power rating. Typical operation is 200 hours per year, with maximum expected usage of 500 hours per year.

Ratings are based on SAE J1349 standard conditions. These ratings also apply at ISO3046 standard conditions.

Fuel Rates are based on fuel oil to specification EPA 2D 89.330-96 with a density of 0.845 – 0.850 kg/L (7.052 – 7.094 lbs/U.S. gal.) @ 15°C (59°F) and fuel inlet temperature 40°C (104°F).

Additional ratings may be available for specific customer requirements, contact your Cat representative for details.

Performance No.: P4514A
Feature Code: NAC223P
Generator Arrangement: 4518416
Date: 09/12/2016
Source Country: U.S.

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LEHE1020-01



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C4.4 and C7.1 Sub-base Fuel Tanks

Newberry
Diesel Generator Set
40 – 200 kW 60 Hz

Features

- UL Listed for United States (UL 142) and Canada (CAN/ULC S601)
- Facilitate compliance with NFPA 30 code, NFPA 37 and 110 standards and CSA C282 code and B139-09 standard
- Welded, heavy steel gauge construction with a containment basin sized as a minimum 110% of the tank
- Gloss black polyester triglycidyl isocyanurate (TGIC) powder coating
- Dedicated external customer interface area with access to the 4" (101.6 mm) fuel fill, visual level gauge, normal and emergency vents
- Rear electrical stub-up area with removable access panel
- Removable engine supply and return dip tubes
- Two additional 1" (25.4 mm) ports for customer use
- Tanks are rated to safely support the weight of the generator
- 8 gal (30.3 L) drip pan for oil and coolant (for generator sets up to 60 kW only)
- Standard NPT tank fittings
- UL listed emergency vents sized as per UL standards 3" (76.2 mm), 4" (101.6 mm), and 5" (127 mm) NPT
- Normal atmospheric vent 1-1/4" (31.75 mm)
- Top-mounted fuel level sensor with control panel alarms
- Top-mounted leak detection switch
- Lockable fuel fill cap, 4" (101.6 mm) NPT

Description

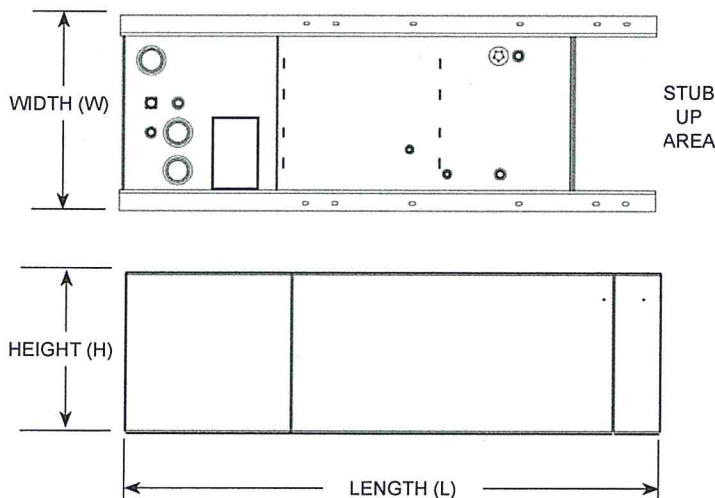
- Dual wall, secondary containment
- Pressure tested to UL requirements
- Fuel tank mounts directly below generator skid base
- Modular tank design is compatible with all factory units open and enclosed

Options

- Emergency vent and normal vent extension kits 12' (3.66 m)
- 5 gal (18.9 L) spill containment
- Overfill prevention valve
- Tank riser to allow for visual secondary containment leak inspection
- Drop tube

C4.4, and C7.1 Sub-base Fuel Tank Dimensions and Capacities

Engine Model	Tank Feature Code	Generator Set Rating kW	Est. Run Time hrs	Fillable Capacity		Usable Capacity		Vent	Length 'L'		Width 'W'		Height 'H'		Weight (Dry)	
				L	gal	L	gal		mm	in	mm	in	mm	in	kg	lb
C4.4	FSBTA24	40	37													
		50	30	552	146	508	134	3					497	19.6	416	917
		60	26						2726	107.3						
	FSBTB48	40	71													
		50	59	1027	271	983	260	4					827	32.6	566	1248
		60	51													
	FSBTC24	80	30	793	209	733	194	3					485	19.1	526	1160
	FSBTD48	100	25						3447	135.7	1000	39.4				
		80	58	1492	394	1432	378	4					835	32.9	739	1629
		100	49													
C7.1	FSBTI24	125	40													
		150	35	1520	402	1495	395	4	4035	158.9			647	25.5	720	1587
		175	29													
		200	27													
	FSBTJ48	125	78													
		150	68	2940	777	2918	771	5	5035	198.2			933	36.7	1145	2524
		175	57													
		200	52													



Note: For reference only – do not use for installation design.
Please contact your local dealer for exact dimensions.

Tanks are UL Listed and constructed in accordance with UL Standard for Safety UL 142, Steel Aboveground Tanks for Flammable and Combustible Liquids and Canada CAN/ULC S601, Standard for Shop Fabricated Steel Aboveground Horizontal Tanks for Flammable and Combustible Liquids.

Fuel tanks facilitate compliance with the following United States NFPA Code and Standards:

- NFPA 30: Flammable and Combustible Liquids Code
- NFPA 37: Standard for the Installation and Use of Stationary Combustion Engines and Gas Turbines
- NFPA 110: Standard for Emergency and Standby Power Systems

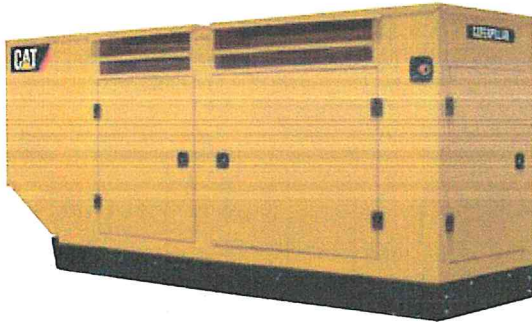
Fuel tanks facilitate compliance with the following Canadian Standard and Code:

- CSA C282 – Emergency Electrical Power Supply for Buildings
- CSA B139-09 – Installation Code for Oil-Burning Equipment

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Picture shown may not reflect actual configuration

Weather Protective and Sound Attenuated Enclosures

D40-6 to D200-2

D40-6S to D100-6S

Features

Highly Corrosion Resistant construction

- Stainless steel flush fitting latches and hinges tested and proven to withstand extreme conditions of corrosion
- Zinc plated or stainless steel fastener

Excellent Access

- Single side access for service and controls
- All non-service sides have removable doors and/or panels
- Radiator fill access
- Lube oil and coolant drains piped to the exterior of the enclosure base
- Large cable entry area for installation ease
- Double doors on both sides
- Vertically hinged doors with solid bar door stays to hold doors in place when open

Security and Safety

- Lockable access doors which give full access to control panel and breaker
- Cooling fan and battery charging alternator fully guarded
- Fuel fill, oil fill, and battery can only be reached via lockable access
- Stub-up area is rodent proof

Transportability

- These enclosures are of extremely rugged construction to withstand outdoor exposure and rough handling common on many construction sites. The sound deadening material is of a self-extinguishing design
- This range of enclosures are designed on modular principles with many interchangeable components permitting on site repair

Options

- Weather Protective - constructed with 16 gauge steel; industrial silencer mounted within the main enclosure body
- Sound Attenuated Level 1 - constructed with 16 gauge steel; weather protective with critical silencer - silencer mounted in separate upward discharging radiator hood
- Sound Attenuated Level 2 - constructed with 16 gauge steel; weather protective with critical silencer and 100% lined with sound deadening material – silencer mounted in separate upward discharging radiator hood
- Sound Attenuated Aluminum constructed with 14 gauge Aluminum 5052 grade. Weather protective with critical silencer and 100% lined with sound deadening material – silencer mounted in separate upward discharging radiator hood
- Caterpillar Yellow* or white paint
- UL Listed sub base tanks
- Externally mounted emergency stop button
- Seismic certification per applicable building codes: IBC 2000, IBC 2003, IBC 2006, IBC 2009, IBC 2012, CBC 2007, CBC 2010
- IBC certification for 180 mph wind loading

*Not available with Aluminium enclosures

Enclosure Sound Pressure Levels (SPL) at 100%

Weather Protective Enclosure		Cooling Air Flow Rate		SPL @7m (23ft)
Model	Standby eKW	m³/s	cfm	dBA
D40-6	40	1.6	3475	72
D50-6	50	1.6	3475	72
D60-6	60	1.9	3920	75
D80-6	80	3.2	6696	79
D100-6	100	3.6	7564	81
D125-8	125	4.6	9676	78
D150-10	150	4.6	9676	79
D175-4	175	5.9	12431	84
D200-2	200	5.9	12431	89

SA Level 1 Enclosure		Cooling Air Flow Rate		SPL @7m (23ft)
Model	Standby eKW	m³/s	cfm	dBA
D40-6	40	1.7	3602	66
D50-6	50	1.7	3602	66
D60-6	60	1.8	3899	71
D80-6	80	3.2	6696	77
D100-6	100	3.2	6696	78
D125-8	125	4.2	8899	74
D150-10	150	4.2	8899	74
D175-4	175	5.6	11830	78
D200-2	200	5.5	11654	81

SA Level 2 Enclosure		Cooling Air Flow Rate		SPL @7m (23ft)
Model	Standby eKW	m³/s	cfm	dBA
D40-6	40	1.7	3602	65
D50-6	50	1.7	3602	66
D60-6	60	1.8	3899	69
D80-6	80	3.2	6696	75
D100-6	100	3.2	6696	76
D125-8	125	4.2	8899	74
D150-10	150	4.2	8899	74
D175-4	175	5.2	11018	74
D200-2	200	5.1	10806	75

Enclosures



SA Aluminum Enclosure		Cooling Air Flow Rate		SPL @7m (23ft)
Model	Standby eKW	m ³ /s	cfm	dBA
D40-6	40	1.7	3602	68
D50-6	50	1.7	3602	69
D60-6	60	1.8	3899	70
D80-6	80	3.2	6696	73
D100-6	100	3.2	6696	74
D125-8	125	4.2	8899	74
D150-10	150	4.2	8899	75
D175-4	175	5.2	11018	75
D200-2	200	5.1	10806	75

The sound pressure level data shown above is quoted as free field and is for guidance only. Actual levels produced may vary according to site conditions.

Enclosure Dimensions and Weights

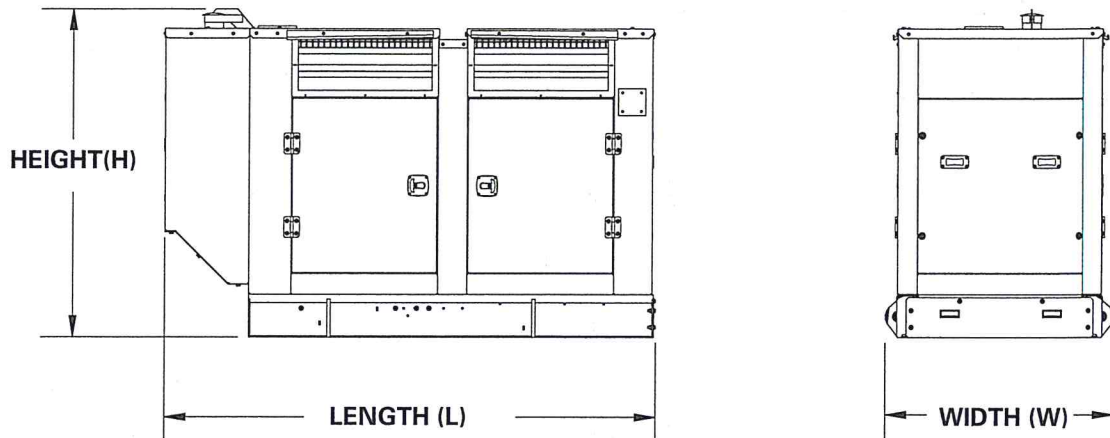


Image represents SA Level 1, SA Level 2 and SA Aluminum enclosures on skid base only

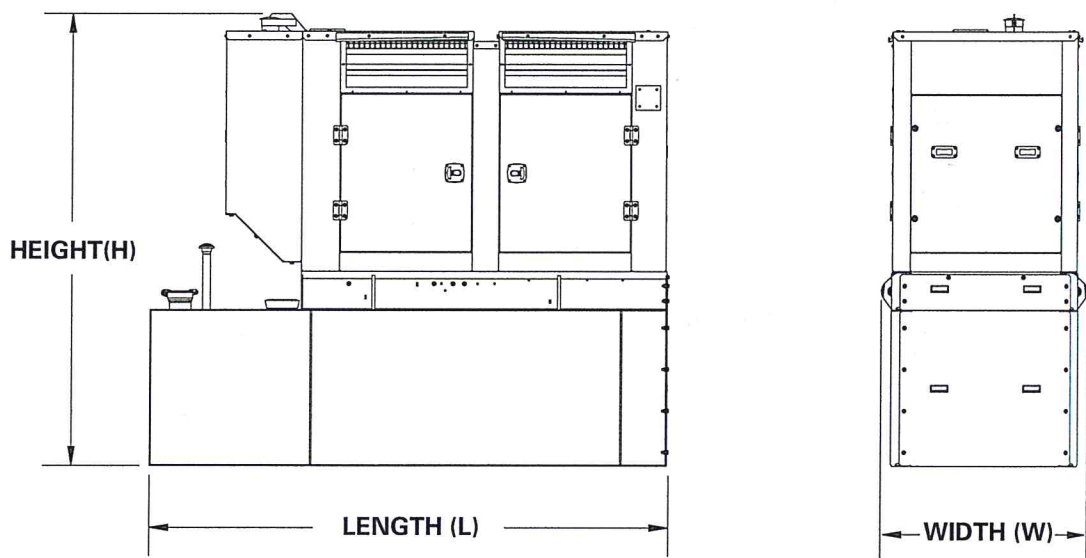


Image represents SA Level 1, SA Level 2 and SA Aluminum enclosures mounted on optional UL listed sub base tank

Model	Standby eKW	WP Industrial		SA Level 1		SA Level 2		SA Aluminum	
		kg	lb	kg	lb	kg	lb	kg	lb
D40-6	40	220	484	272	599	278	612	117	258
D50-6	50								
D60-6	60								
D80-6	80	263	580	313	690	321	708	142	312
D100-6	100								
D125-8	125								
D150-10	150	348	768	393	867	406	896	176	387
D175-4	175								
D200-2	200								

Enclosure weights (includes muffler)

Enclosure Dimensions Skid Bases

Engine Model	Generator Set Rating kW	Enclosure	Width 'W'		Length 'L'		Height 'H'	
			mm	in	mm	in	mm	in
C4.4	40	WP	1110	43.7	2055	80.9	1590	62.6
	50							
	60							
	40	SA Level 1, SA Level 2 and SA Aluminum	1110	43.7	2335	91.9	1570	61.8
	50							
	60							
C4.4	80	WP	1110	43.7	2523	99.3	1773	69.8
	100							
	80	SA Level 1, SA Level 2 and SA Aluminum	1110	43.7	2891	113.8	1852	72.9
	100							
C7.1	125	WP	1110	43.7	3204	126.1	1773	69.8
	150							
	175							
	200							
	125	SA Level 1, SA Level 2 and SA Aluminum	1110	43.7	3659	144.1	1852	72.9
	150							
	175							
	200							

Enclosure Dimensions on UL Listed Sub Base Tanks

Engine Model	Generator Set Rating kW	Enclosure	146 Gallon Sub Base Tank				271 Gallon Sub Base Tank			
			Length 'L'		Height 'H'		Length 'L'		Height 'H'	
			mm	in	mm	in	mm	in	mm	in
C4.4	40	WP	2726	107.3	2087	82.1	2726	107.3	2417	95.1
	50									
	60									
	40	SA Level 1, SA Level 2 and SA Aluminum	2726	107.3	2067	81.4	2726	107.3	2397	94.4
	50									
	60									

Engine Model	Generator Set Rating kW	Enclosure	209 Gallon Sub Base Tank				394 Gallon Sub Base Tank			
			Length 'L'		Height 'H'		Length 'L'		Height 'H'	
			mm	in	mm	in	mm	in	mm	in
C4.4	80	WP	3447	135.7	2258	88.9	3447	135.7	2608	102.7
	100									
	80	SA Level 1, SA Level 2 and SA Aluminum	3447	135.7	2337	92.0	3447	135.7	2687	105.8
	100									

Engine Model	Generator Set Rating kW	Enclosure	402 Gallon Sub Base Tank				777 Gallon Sub Base Tank			
			Length 'L'		Height 'H'		Length 'L'		Height 'H'	
			mm	in	mm	in	mm	in	mm	in
C7.1	125	WP	4035	158.9	2420	95.3	5035	198.2	2706	106.5
	150									
	175									
	200									
	125	SA Level 1, SA Level 2 and SA Aluminum	4035	158.9	2499	98.4	5035	198.2	2785	106.5
	150									
	175									
	200									

Note: Weight includes oil and coolant but not fuel

Ref: WPIA, WPIB, WPIC, SATCBA, SATCBB, SAT, CBC, SATFBA, SATFBB, SATFBC, ENCAL02, ENCAL03, ENCAL04.

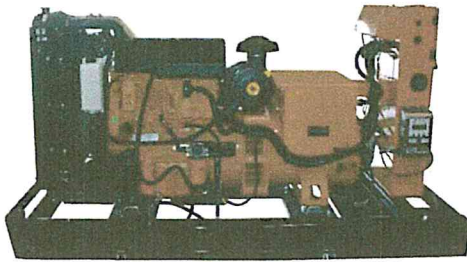
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C4.4 Generator Set

Electric Power



Caterpillar is leading the power generation marketplace with Power Solutions engineered to deliver unmatched flexibility, expandability, reliability, and cost-effectiveness.

Image shown may not reflect actual configuration

Specifications

Generator Set Specifications	
Rating	80 ekW (100 kVA)
Voltage	480 Volts
Frequency	60 Hz
Speed	1800 rpm

Generator Set Configurations	
Emissions/Fuel Strategy	U.S. EPA Certified for Stationary Emergency Application (Tier 3 Nonroad Equivalent Emission Standards)

Engine Specifications	
Engine Model	C4.4 Vertical In-line 4, 4-cycle diesel
Bore	105.0 mm 4.13 in
Displacement	4.4 L 268.5 in ³
Stroke	127.0 mm 5.0 in
Compression Ratio	16.7:1
Aspiration	Turbocharged Air-to-Air-Aftercooled
Governor Type	Electronic
Fuel System	Common Rail

Package Dimensions*		
Length	2362 mm	93 in
Width	1110 mm	44 in
Height	1304 mm	51 in
Weight†	1130 kg	2491 lb

*Note: For reference only – do not use for installation design. Please contact your local dealer for exact weight and dimensions.

†Weight includes: Oversize generator, skid base, circuit breaker, oil, and coolant.

Benefits & Features

Cat® Diesel Engine

- Reliable, rugged, durable design
- Field-proven in thousands of applications worldwide
- Four-stroke cycle diesel engine combines consistent performance and excellent fuel economy with minimum weight
- Electronic engine control

Generator

- Matched to the performance and output characteristics of Cat engines
- Industry-leading mechanical and electrical design
- Industry-leading motor starting capabilities
- High efficiency

Cat EMCP Control Panel

The EMCP controller features the reliability and durability you have come to expect from your Cat equipment. EMCP 4 is a scalable control platform designed to ensure reliable generator set operation, providing extensive information about power output and engine operation. EMCP 4 systems can be further customized to meet your needs through programming and expansion modules.

Seismic Certification

- Seismic certification available.
- Anchoring details are site specific, and are dependent on many factors such as generator set size, weight, and concrete strength.
- IBC certification requires that the anchoring system used is reviewed and approved by a professional engineer.
- Seismic certification per applicable building codes: IBC 2000, IBC 2003, IBC 2006, IBC 2009, CBC 2007, CBC 2010.

Design Criteria

- The generator set accepts 100% rated load in one step per NFPA 110 and meets ISO 8528-5 transient response.
- Cooling system designed to operate in 50°C/122°F ambient temperatures with an air flow restriction of 0.5 in. water.

UL 2200/CSA – Optional

- UL 2200 Listed
 - CSA Certified
- Certain restrictions may apply. Consult with your Cat dealer.

Single-Source Supplier

Fully prototype tested with certified torsional vibration analysis.

Worldwide Product Support

Cat dealers provide extensive post-sale support including maintenance and repair agreements. Cat dealers have over 1,800 dealer branch stores operating in 200 countries. The Cat S•O•SSM program cost effectively detects internal engine component condition, even the presence of unwanted fluids and combustion by-products.

Standard Equipment

Air Inlet

- Single element Air filter

Cooling

- Radiator and cooling fan complete with protective guards
- Standard ambient temperatures up to 50°C (122°F)

Exhaust

- Exhaust flange outlet

Fuel

- Primary and secondary fuel filters
- Fuel priming pump
- Flexible fuel lines

Generator

- Matched to the performance and output characteristics of Cat engines
- Load adjustment module provides engine relief upon load impact and improves load acceptance and recovery time
- IP23 protection
- Integrated Voltage Regulation

Governor

- Electronic governor – ADEM™ A4

Control Panels

- EMCP 4.2 Series generator set controller

Mounting

- Rubber vibration isolators

Starting/Charging

- 12 volt starting motor
- Battery with rack and cables

General

- Paint – Caterpillar Yellow except rails and radiators gloss black

Optional Equipment

Exhaust

- Industrial, residential, critical mufflers

Generator

- Excitation: ☐ Permanent Magnet Excited (PM) ☐ Internally Excited (IE)
- Anti-condensation heater
- Oversize and premium generators

Starting/Charging

- Battery charger – UL 10 amp
- Battery disconnect switch
- Jacket water heater

General

- UL 2200
- CSA Certification
- Enclosures: sound attenuated, weather protective
- Sub-base dual wall UL Listed fuel tanks
- Automatic transfer switches (ATS)

ELECTRIC POWER – Technical Spec Sheet STANDARD

C4.4

80 ekW/ 100 kVA/ 60 Hz/ 1800 rpm/ 480V/ 0.8 Power Factor

Rating Type: STANDBY

Emissions: U.S. EPA Certified for Stationary Emergency Application
(Tier 3 Nonroad Equivalent Emission Standards)

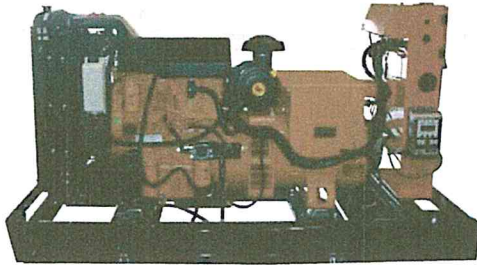


Image shown may not reflect actual configuration

D80-8

80 ekW/ 100 kVA
60Hz/ 1800 rpm/ 480V

Package Performance

Generator Set Power Rating with Fan @ 0.8 Power Factor	80 ekW
Generator Set Power Rating	100 kVA

Fuel Consumption

100% Load With Fan	23.7 L/hr	6.3 gal/hr
75% Load With Fan	19.0 L/hr	5.0 gal/hr
50% Load With Fan	13.9 L/hr	3.7 gal/hr

Cooling System¹

Engine Coolant Capacity	7.0 L	1.8 gal
Radiator Coolant Capacity	10.0 L	2.6 gal
Engine Coolant Capacity with Radiator/Exp Tank	17.0 L	4.5 gal
Air Flow Restriction (System)	0.12 kPa	0.48 in. water

Inlet Air

Combustion Air Inlet Flow Rate	7.8 m ³ /min	275 cfm
--------------------------------	-------------------------	---------

Exhaust System

Exhaust Stack Gas Temperature	630°C	1166°F
Exhaust Gas Flow Rate	17.6 m ³ /min	620 cfm
Exhaust System Backpressure (maximum allowable)	15.0 kPa	60.2 in. water
Exhaust Flange Size (internal diameter)	64 mm	2.5 in

ELECTRIC POWER – Technical Spec Sheet STANDARD

C4.4

80 ekW/ 100 kVA/ 60 Hz/ 1800 rpm/ 480V/ 0.8 Power Factor

Rating Type: **STANDBY**

Emissions: **U.S. EPA Certified for Stationary Emergency Application
(Tier 3 Nonroad Equivalent Emission Standards)**

Heat Rejection		
Heat Rejection to Coolant (total)	47.9 kW	2724 Btu/min
Heat Rejection to Exhaust (total)	77.7 kW	4419 Btu/min
Heat Rejection to Atmosphere from Engine	13.5 kW	768 Btu/min
Heat Rejection to Atmosphere from Generator	7.1 kW	404 Btu/min

Alternator ²		
Motor Starting Capability @ 30% Voltage Dip	215 skVA	
Frame	LC3114D	
Temperature Rise	105°C	189°F
Excitation	Self Excited	

Lube System		
Sump Refill with Filter	8.4 L	2.2 gal

Emissions (Nominal) ³	
NOx + HC	3.6 g/kW-hr
CO	0.9 g/kW-hr
PM	0.12 g/kW-hr

¹ For ambient and altitude capabilities consult your Cat dealer. Air flow restriction (system) is added to the existing restriction from the factory.

² Generator temperature rise is based on a 40°C (104°F) ambient per NEMA MG1-32.

³ The nominal emissions data shown is subject to instrumentation, measurement, facility and engine to engine variations. Emissions data is based on 100% Prime load. This information should not be used for permitting purposes and is subject to change without notice. Contact your Cat dealer for further details.

ELECTRIC POWER – Technical Spec Sheet STANDARD

C4.4

80 ekW/ 100 kVA/ 60 Hz/ 1800 rpm/ 480V/ 0.8 Power Factor

Rating Type: STANDBY

Emissions: U.S. EPA Certified for Stationary Emergency Application
(Tier 3 Nonroad Equivalent Emission Standards)

DEFINITIONS AND CONDITIONS

Applicable Codes and Standards:

AS1359, CSA C22.2 No 100-04, UL142, UL489, UL601, UL869, UL2200, NFPA 37, NFPA 70, NFPA 99, NFPA 110, IBC, IEC60034-1, ISO3046, ISO8528, NEMA MG 1-22, NEMA MG 1-33, 72/23/EEC, 98/37/EC, 2004/108/EC.

STANDBY: Output available with varying load for the duration of the interruption of the normal source power. Average power output is 70% of the standby power rating. Typical operation is 200 hours per year, with maximum expected usage of 500 hours per year.

Ratings are based on SAE J1349 standard conditions. These ratings also apply at ISO3046 standard conditions.

Fuel Rates are based on fuel oil to specification EPA 2D 89.330-96 with a density of 0.845 – 0.850 kg/L (7.052 – 7.094 lbs/U.S. gal.) @ 15°C (59°F) and fuel inlet temperature 40°C (104°F).

Additional ratings may be available for specific customer requirements, contact your Cat representative for details.

Performance No.: P4510A
Feature Code: NAC222P
Generator Arrangement: 4518416
Date: 03/24/2016
Source Country: U.S.

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LEHE1041-00



Image shown may not reflect actual configuration

C4.4 and C7.1 Sub-base Fuel Tanks

Newberry
Diesel Generator Set
40 – 200 kW 60 Hz

Features

- UL Listed for United States (UL 142) and Canada (CAN/ULC S601)
- Facilitate compliance with NFPA 30 code, NFPA 37 and 110 standards and CSA C282 code and B139-09 standard
- Welded, heavy steel gauge construction with a containment basin sized as a minimum 110% of the tank
- Gloss black polyester triglycidyl isocyanurate (TGIC) powder coating
- Dedicated external customer interface area with access to the 4" (101.6 mm) fuel fill, visual level gauge, normal and emergency vents
- Rear electrical stub-up area with removable access panel
- Removable engine supply and return dip tubes
- Two additional 1" (25.4 mm) ports for customer use
- Tanks are rated to safely support the weight of the generator
- 8 gal (30.3 L) drip pan for oil and coolant (for generator sets up to 60 kW only)
- Standard NPT tank fittings
- UL listed emergency vents sized as per UL standards 3" (76.2 mm), 4" (101.6 mm), and 5" (127 mm) NPT
- Normal atmospheric vent 1-1/4" (31.75 mm)
- Top-mounted fuel level sensor with control panel alarms
- Top-mounted leak detection switch
- Lockable fuel fill cap, 4" (101.6 mm) NPT

Description

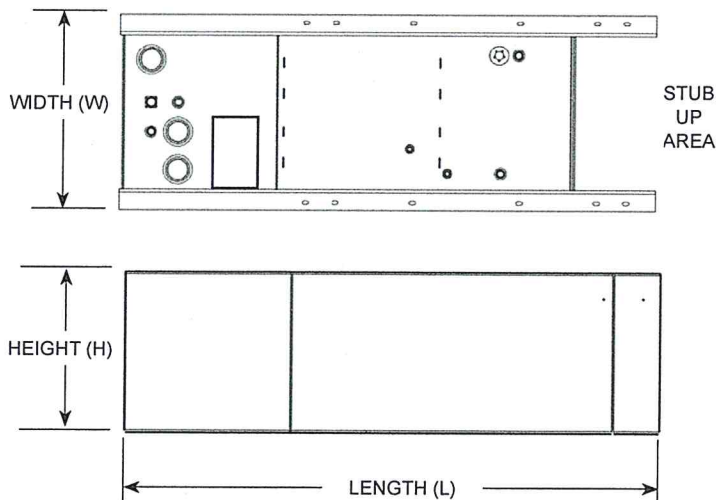
- Dual wall, secondary containment
- Pressure tested to UL requirements
- Fuel tank mounts directly below generator skid base
- Modular tank design is compatible with all factory units open and enclosed

Options

- Emergency vent and normal vent extension kits 12' (3.66 m)
- 5 gal (18.9 L) spill containment
- Overfill prevention valve
- Tank riser to allow for visual secondary containment leak inspection
- Drop tube

C4.4, and C7.1 Sub-base Fuel Tank Dimensions and Capacities

Engine Model	Tank Feature Code	Generator Set Rating ekW	Est. Run Time hrs	Fillable Capacity		Usable Capacity		Vent in	Length 'L'		Width 'W'		Height 'H'		Weight (Dry)	
				L	gal	L	gal		mm	in	mm	in	mm	in	kg	lb
C4.4	FSBTA24	40	37													
		50	30	552	146	508	134	3					497	19.6	416	917
		60	26						2726	107.3						
	FSBTB48	40	71													
		50	59	1027	271	983	260	4					827	32.6	566	1248
		60	51													
	FSBTC24	80	30	793	209	733	194	3					485	19.1	526	1160
		100	25						3447	135.7	1000	39.4				
	FSBTD48	80	58													
		100	49	1492	394	1432	378	4					835	32.9	739	1629
C7.1	FSBTI24	125	40													
		150	35													
		175	29	1520	402	1495	395	4	4035	158.9			647	25.5	720	1587
		200	27													
	FSBTJ48	125	78													
		150	68													
		175	57	2940	777	2918	771	5	5035	198.2			933	36.7	1145	2524
		200	52													



Note: For reference only – do not use for installation design.
Please contact your local dealer for exact dimensions.

Tanks are UL Listed and constructed in accordance with UL Standard for Safety UL 142, Steel Aboveground Tanks for Flammable and Combustible Liquids and Canada CAN/ULC S601, Standard for Shop Fabricated Steel Aboveground Horizontal Tanks for Flammable and Combustible Liquids.

Fuel tanks facilitate compliance with the following United States NFPA Code and Standards:

- NFPA 30: Flammable and Combustible Liquids Code
- NFPA 37: Standard for the Installation and Use of Stationary Combustion Engines and Gas Turbines
- NFPA 110: Standard for Emergency and Standby Power Systems

Fuel tanks facilitate compliance with the following Canadian Standard and Code:

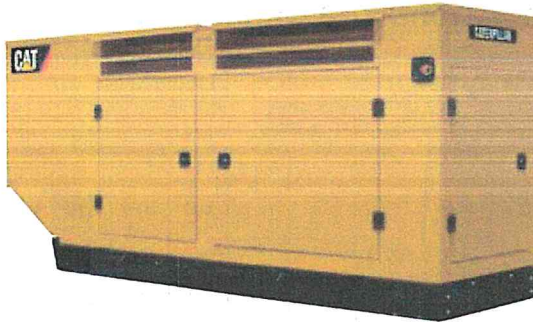
- CSA C282 – Emergency Electrical Power Supply for Buildings
- CSA B139-09 – Installation Code for Oil-Burning Equipment

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Picture shown may not reflect actual configuration

Features

Highly Corrosion Resistant construction

- Stainless steel flush fitting latches and hinges tested and proven to withstand extreme conditions of corrosion
- Zinc plated or stainless steel fastener

Excellent Access

- Single side access for service and controls
- All non-service sides have removable doors and/or panels
- Radiator fill access
- Lube oil and coolant drains piped to the exterior of the enclosure base
- Large cable entry area for installation ease
- Double doors on both sides
- Vertically hinged doors with solid bar door stays to hold doors in place when open

Security and Safety

- Lockable access doors which give full access to control panel and breaker
- Cooling fan and battery charging alternator fully guarded
- Fuel fill, oil fill, and battery can only be reached via lockable access
- Stub-up area is rodent proof

Transportability

- These enclosures are of extremely rugged construction to withstand outdoor exposure and rough handling common on many construction sites. The sound deadening material is of a self-extinguishing design
- This range of enclosures are designed on modular principles with many interchangeable components permitting on site repair

Weather Protective and Sound Attenuated Enclosures

D40-6 to D200-2

D40-6S to D100-6S

Options

- Weather Protective - constructed with 16 gauge steel; industrial silencer mounted within the main enclosure body
- Sound Attenuated Level 1 - constructed with 16 gauge steel; weather protective with critical silencer - silencer mounted in separate upward discharging radiator hood
- Sound Attenuated Level 2 - constructed with 16 gauge steel; weather protective with critical silencer and 100% lined with sound deadening material – silencer mounted in separate upward discharging radiator hood
- Sound Attenuated Aluminum constructed with 14 gauge Aluminum 5052 grade. Weather protective with critical silencer and 100% lined with sound deadening material – silencer mounted in separate upward discharging radiator hood
- Caterpillar Yellow* or white paint
- UL Listed sub base tanks
- Externally mounted emergency stop button
- Seismic certification per applicable building codes: IBC 2000, IBC 2003, IBC 2006, IBC 2009, IBC 2012, CBC 2007, CBC 2010
- IBC certification for 180 mph wind loading

*Not available with Aluminium enclosures

Enclosure Sound Pressure Levels (SPL) at 100%

Weather Protective Enclosure		Cooling Air Flow Rate		SPL @7m (23ft)
Model	Standby eKW	m³/s	cfm	dBA
D40-6	40	1.6	3475	72
D50-6	50	1.6	3475	72
D60-6	60	1.9	3920	75
D80-6	80	3.2	6696	79
D100-6	100	3.6	7564	81
D125-8	125	4.6	9676	78
D150-10	150	4.6	9676	79
D175-4	175	5.9	12431	84
D200-2	200	5.9	12431	89

SA Level 1 Enclosure		Cooling Air Flow Rate		SPL @7m (23ft)
Model	Standby eKW	m³/s	cfm	dBA
D40-6	40	1.7	3602	66
D50-6	50	1.7	3602	66
D60-6	60	1.8	3899	71
D80-6	80	3.2	6696	77
D100-6	100	3.2	6696	78
D125-8	125	4.2	8899	74
D150-10	150	4.2	8899	74
D175-4	175	5.6	11830	78
D200-2	200	5.5	11654	81

SA Level 2 Enclosure		Cooling Air Flow Rate		SPL @7m (23ft)
Model	Standby eKW	m³/s	cfm	dBA
D40-6	40	1.7	3602	65
D50-6	50	1.7	3602	66
D60-6	60	1.8	3899	69
D80-6	80	3.2	6696	75
D100-6	100	3.2	6696	76
D125-8	125	4.2	8899	74
D150-10	150	4.2	8899	74
D175-4	175	5.2	11018	74
D200-2	200	5.1	10806	75

Enclosures



SA Aluminum Enclosure		Cooling Air Flow Rate		SPL @7m (23ft)
Model	Standby eKW	m ³ /s	cfm	dBA
D40-6	40	1.7	3602	68
D50-6	50	1.7	3602	69
D60-6	60	1.8	3899	70
D80-6	80	3.2	6696	73
D100-6	100	3.2	6696	74
D125-8	125	4.2	8899	74
D150-10	150	4.2	8899	75
D175-4	175	5.2	11018	75
D200-2	200	5.1	10806	75

The sound pressure level data shown above is quoted as free field and is for guidance only. Actual levels produced may vary according to site conditions.

Enclosure Dimensions and Weights

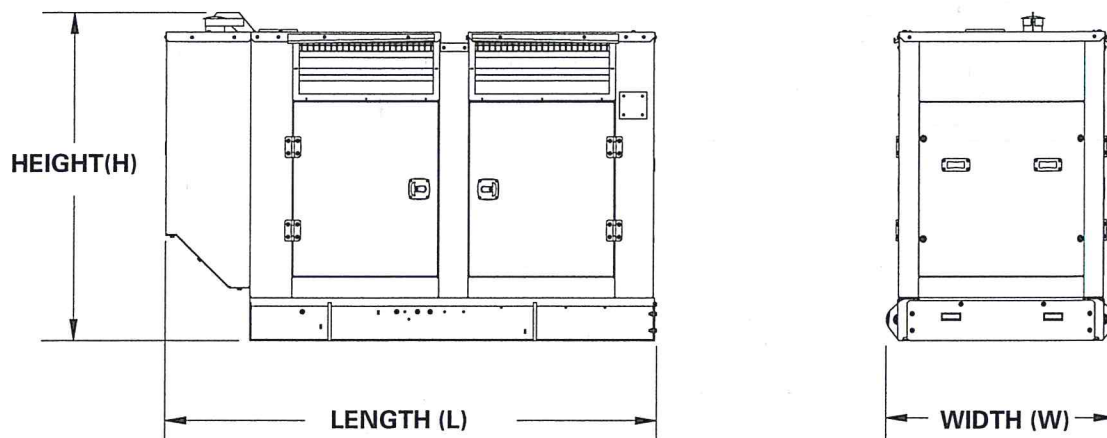


Image represents SA Level 1, SA Level 2 and SA Aluminum enclosures on skid base only

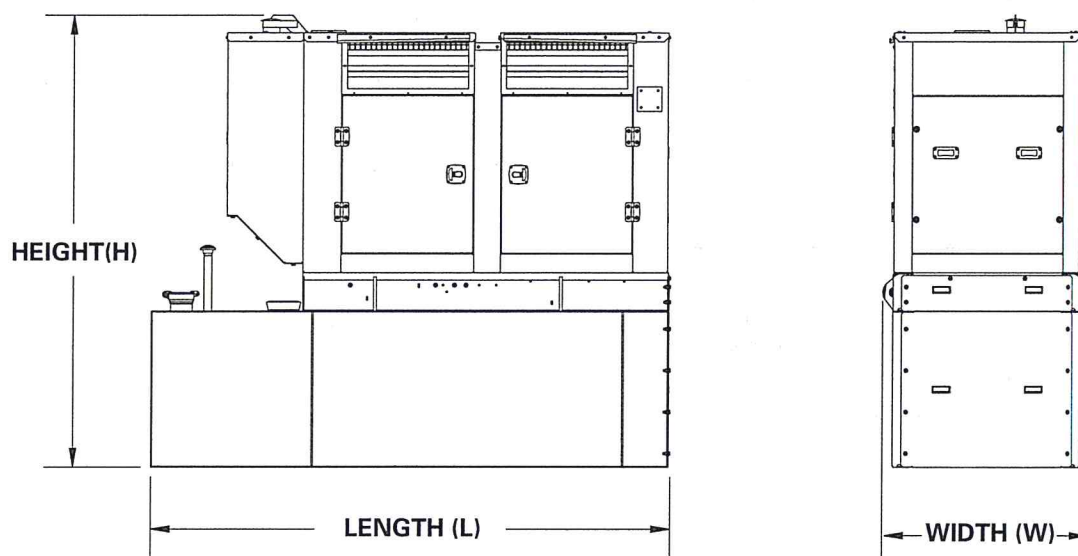


Image represents SA Level 1, SA Level 2 and SA Aluminum enclosures mounted on optional UL listed sub base tank

Model	Standby eKW	WP Industrial		SA Level 1		SA Level 2		SA Aluminum	
		kg	lb	kg	lb	kg	lb	kg	lb
D40-6	40	220	484	272	599	278	612	117	258
D50-6	50								
D60-6	60								
D80-6	80	263	580	313	690	321	708	142	312
D100-6	100								
D125-8	125								
D150-10	150	348	768	393	867	406	896	176	387
D175-4	175								
D200-2	200								

Enclosure weights (includes muffler)

Enclosure Dimensions Skid Bases

Engine Model	Generator Set Rating kW	Enclosure	Width 'W'		Length 'L'		Height 'H'	
			mm	in	mm	in	mm	in
C4.4	40	WP	1110	43.7	2055	80.9	1590	62.6
	50							
	60							
	40	SA Level 1, SA Level 2 and SA Aluminum	1110	43.7	2335	91.9	1570	61.8
	50							
	60							
C4.4	80	WP	1110	43.7	2523	99.3	1773	69.8
	100							
	80	SA Level 1, SA Level 2 and SA Aluminum	1110	43.7	2891	113.8	1852	72.9
	100							
C7.1	125	WP	1110	43.7	3204	126.1	1773	69.8
	150							
	175							
	200							
	125	SA Level 1, SA Level 2 and SA Aluminum	1110	43.7	3659	144.1	1852	72.9
	150							
	175							
	200							

Enclosure Dimensions on UL Listed Sub Base Tanks

Engine Model	Generator Set Rating kW	Enclosure	146 Gallon Sub Base Tank				271 Gallon Sub Base Tank			
			Length 'L'		Height 'H'		Length 'L'		Height 'H'	
			mm	in	mm	in	mm	in	mm	in
C4.4	40	WP	2726	107.3	2087	82.1	2726	107.3	2417	95.1
	50									
	60									
	40	SA Level 1, SA Level 2 and SA Aluminum	2726	107.3	2067	81.4	2726	107.3	2397	94.4
	50									
	60									

Engine Model	Generator Set Rating kW	Enclosure	209 Gallon Sub Base Tank				394 Gallon Sub Base Tank			
			Length 'L'		Height 'H'		Length 'L'		Height 'H'	
			mm	in	mm	in	mm	in	mm	in
C4.4	80	WP	3447	135.7	2258	88.9	3447	135.7	2608	102.7
	100									
	80	SA Level 1, SA Level 2 and SA Aluminum	3447	135.7	2337	92.0	3447	135.7	2687	105.8
	100									

Engine Model	Generator Set Rating kW	Enclosure	402 Gallon Sub Base Tank				777 Gallon Sub Base Tank			
			Length 'L'		Height 'H'		Length 'L'		Height 'H'	
			mm	in	mm	in	mm	in	mm	in
C7.1	125	WP	4035	158.9	2420	95.3	5035	198.2	2706	106.5
	150									
	175									
	200									
	125	SA Level 1, SA Level 2 and SA Aluminum	4035	158.9	2499	98.4	5035	198.2	2785	106.5
	150									
	175									
	200									

Note: Weight includes oil and coolant but not fuel

Ref: WPIA, WPIB, WPIC, SATCBA, SATCBB, SAT, CBC, SATFBA, SATFBB, SATFBC, ENCAL02, ENCAL03, ENCAL04.

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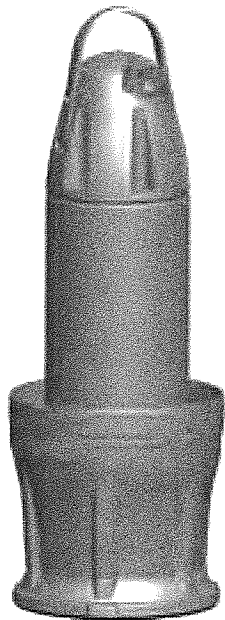
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Installation, Operation
and Maintenance



Flygt P7030, P7035, P7040

FLYGT 
a xylem brand

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1 Introduction and Safety

1.1 Introduction

Purpose of the manual

The purpose of this manual is to provide necessary information for working with the unit. Read this manual carefully before starting work.

Read and keep the manual

Save this manual for future reference, and keep it readily available at the location of the unit.

Intended use



WARNING:

Operating, installing, or maintaining the unit in any way that is not covered in this manual could cause death, serious personal injury, or damage to the equipment and the surroundings. This includes any modification to the equipment or use of parts not provided by Xylem. If there is a question regarding the intended use of the equipment, please contact a Xylem representative before proceeding.

Other manuals

See also the safety requirements and information in the original manufacturer's manuals for any other equipment furnished separately for use in this system.




1.2 Safety terminology and symbols

About safety messages

It is extremely important that you read, understand, and follow the safety messages and regulations carefully before handling the product. They are published to help prevent these hazards:



- Personal accidents and health problems
- Damage to the product and its surroundings
- Product malfunction

Hazard levels

Hazard level	Indication
 DANGER:	A hazardous situation which, if not avoided, will result in death or serious injury
 WARNING:	A hazardous situation which, if not avoided, could result in death or serious injury
 CAUTION:	A hazardous situation which, if not avoided, could result in minor or moderate injury
NOTICE:	Notices are used when there is a risk of equipment damage or decreased performance, but not personal injury.

Special symbols

Some hazard categories have specific symbols, as shown in the following table.

Electrical hazard	Magnetic fields hazard
 <p>Electrical Hazard:</p>	 <p>CAUTION:</p>

1.3 User safety

All regulations, codes, and health and safety directives must be observed.

The site

- Observe lockout/tagout procedures before starting work on the product, such as transportation, installation, maintenance, or service.
- Pay attention to the risks presented by gas and vapors in the work area.
- Always be aware of the area surrounding the equipment, and any hazards posed by the site or nearby equipment.

Qualified personnel

This product must be installed, operated, and maintained by qualified personnel only.

Protective equipment and safety devices

- Use personal protective equipment as needed. Examples of personal protective equipment include, but are not limited to, hard hats, safety goggles, protective gloves and shoes, and breathing equipment.
- Make sure that all safety features on the product are functioning and in use at all times when the unit is being operated.

1.4 Ex-approved products

Follow these special handling instructions if you have an Ex-approved unit.

Personnel requirements

These are the personnel requirements for Ex-approved products in potentially explosive atmospheres:

- All work on the product must be carried out by certified electricians and Xylem authorized mechanics. Special rules apply to installations in explosive atmospheres.
- All users must know about the risks of electric current and the chemical and physical characteristics of the gas, the vapor, or both present in hazardous areas.
- Any maintenance for Ex-approved products must conform to international and national standards (for example, IEC/EN 60079-17).

Xylem disclaims all responsibility for work done by untrained and unauthorized personnel.

Product and product handling requirements

These are the product and product handling requirements for Ex-approved products in potentially explosive atmospheres:

- Only use the product in accordance with the approved motor data.
- The Ex-approved product must never run dry during normal operation. Dry running during service and inspection is only permitted outside the classified area.
- Before you start work on the product, make sure that the product and the control panel are isolated from the power supply and the control circuit, so they cannot be energized.
- Do not open the product while it is energized or in an explosive gas atmosphere.
- Make sure that thermal contacts are connected to a protection circuit according to the approval classification of the product, and that they are in use.

- Intrinsically safe circuits are normally required for the automatic level-control system by the level regulator if mounted in zone 0.
- The yield stress of fasteners must be in accordance with the approval drawing and the product specification.
- Do not modify the equipment without approval from an Ex-approved Xylem representative.
- Only use parts that are provided by an Ex-approved Xylem representative.
- The thermal detectors fitted to the stator windings shall be connected into the motor control circuit in such a manner as to disconnect the supply to the motor in order to prevent the Temperature Class T3.
- The width of flameproof joints is more than the values specified in the tables of the IEC 60079-1 standard.
- The gap of flameproof joints is less than the values specified in Table 1 of the IEC 60079-1 standard.
- The equipment must be submerged during normal operation.

Fasteners

The screws used for the assembly of the various parts of explosion-proof enclosures must be of quality higher than or equal to A4-80.

Guidelines for compliance

Compliance is fulfilled only when you operate the unit within its intended use. Do not change the conditions of the service without the approval of an Ex-approved Xylem representative. When you install or maintain explosion proof products, always comply with the directive and applicable standards (for example, IEC/EN 60079-14).

Minimum permitted liquid level

See the dimensional drawings of the product for the minimum permitted liquid level according to the approval for explosion proof products. If the information is missing on the dimensional drawing, the product must be fully submerged. Level-sensing equipment must be installed if the product can be operated at less than the minimum submersion depth.

Monitoring equipment

For additional safety, use condition-monitoring devices. Condition-monitoring devices include but are not limited to the following:

- Level indicators
- Temperature detectors

1.5 Special hazards

Biological hazards

The product is designed for use in liquids that can be hazardous to your health. Observe these rules when you work with the product:

- Make sure that all personnel who may come into contact with biological hazards are vaccinated against diseases to which they may be exposed.
- Observe strict personal cleanliness.



WARNING: Biological Hazard

Infection risk. Rinse the unit thoroughly with clean water before working on it.

Wash the skin and eyes

Follow these procedures for chemicals or hazardous fluids that have come into contact with your eyes or your skin:

Condition	Action
Chemicals or hazardous fluids in eyes	<ol style="list-style-type: none"> 1. Hold your eyelids apart forcibly with your fingers. 2. Rinse the eyes with eyewash or running water for at least 15 minutes. 3. Seek medical attention.
Chemicals or hazardous fluids on skin	<ol style="list-style-type: none"> 1. Remove contaminated clothing. 2. Wash the skin with soap and water for at least 1 minute. 3. Seek medical attention, if necessary.

1.6 Protecting the environment

Emissions and waste disposal

Observe the local regulations and codes regarding:

- Reporting of emissions to the appropriate authorities
- Sorting, recycling and disposal of solid or liquid waste
- Clean-up of spills

Exceptional sites



CAUTION: Radiation Hazard

Do NOT send the product to Xylem if it has been exposed to nuclear radiation, unless Xylem has been informed and appropriate actions have been agreed upon.

1.7 Spare parts



CAUTION:

Only use the manufacturer's original spare parts to replace any worn or faulty components. The use of unsuitable spare parts may cause malfunctions, damage, and injuries as well as void the warranty.

1.8 Warranty

For information about warranty, see the sales contract.

2 Transportation and Storage

2.1 Inspect the delivery

2.1.1 Inspect the package

1. Inspect the package for damaged or missing items upon delivery.
2. Note any damaged or missing items on the receipt and freight bill.
3. File a claim with the shipping company if anything is out of order.
If the product has been picked up at a distributor, make a claim directly to the distributor.

2.1.2 Inspect the unit

1. Remove packing materials from the product.
Dispose of all packing materials in accordance with local regulations.
2. Inspect the product to determine if any parts have been damaged or are missing.
3. If applicable, unfasten the product by removing any screws, bolts, or straps.
For your personal safety, be careful when you handle nails and straps.
4. Contact the local sales representative if there is any issue.

2.2 Transportation guidelines

Precautions



DANGER: Crush Hazard

Moving parts can entangle or crush. Always disconnect and lock out power before servicing to prevent unexpected startup. Failure to do so could result in death or serious injury.

Position and fastening

The unit can be transported either horizontally or vertically. Make sure that the unit is securely fastened during transportation, and cannot roll or fall over.

2.2.1 Lifting

Always inspect the lifting equipment and tackle before starting any work.



WARNING: Crush Hazard

1) Always lift the unit by its designated lifting points. 2) Use suitable lifting equipment and ensure that the product is properly harnessed. 3) Wear personal protective equipment. 4) Stay clear of cables and suspended loads.

NOTICE:

Never lift the unit by its cables or hose.

Lifting equipment

Lifting equipment is always required when handling the unit. It must fulfill the following requirements:

- The minimum height (contact your local sales and service representative for information) between the lifting hook and the floor must be sufficient to lift the unit.
- The lifting equipment must be able to hoist the unit straight up and down, preferably without the need for resetting the lifting hook.
- The lifting equipment must be securely anchored and in good condition.

- The lifting equipment must support the weight of the entire assembly and must only be used by authorized personnel.
- Two sets of lifting equipment must be used to lift the unit for repair work.
- The lifting equipment must be dimensioned to lift the unit with any remaining pumped media in it.
- The lifting equipment must not be oversized.



CAUTION: Crush Hazard

Over-dimensioned lifting equipment can lead to injury. A site-specific risk analysis must be done.

2.3 Temperature ranges for transportation, handling and storage

Handling at freezing temperature

At temperatures below freezing, the product and all installation equipment, including the lifting gear, must be handled with extreme care.

Make sure that the product is warmed up to a temperature above the freezing point before starting up. Avoid rotating the impeller/propeller by hand at temperatures below the freezing point. The recommended method to warm the unit up is to submerge it in the liquid which will be pumped or mixed.

NOTICE:

Never use a naked flame to thaw the unit.

Unit in as-delivered condition

If the unit is still in the condition in which it left the factory - all packing materials are undisturbed - then the acceptable temperature range during transportation, handling and storage is: -50°C (-58°F) to +60°C (+140°F).

If the unit has been exposed to freezing temperatures, then allow it to reach the ambient temperature of the sump before operating.

Lifting the unit out of liquid

The unit is normally protected from freezing while operating or immersed in liquid, but the impeller/propeller and the shaft seal may freeze if the unit is lifted out of the liquid into a surrounding temperature below freezing.

Units equipped with an internal cooling system are filled with a mixture of water and 30% glycol. This mixture remains a flowing liquid at temperatures down to -13°C (9°F). Below -13°C (9°F), the viscosity increases such that the glycol mixture will lose its flow properties. However, the glycol-water mixture will not solidify completely and thus cannot harm the product.

Follow these guidelines to avoid freezing damage:

1. Empty all pumped liquid, if applicable.
2. Check all liquids used for lubrication or cooling, both oil and water-glycol mixtures, for the presence of unacceptable amounts of water. Change if needed.

2.4 Storage guidelines

Storage location

The product must be stored in a covered and dry location free from heat, dirt, and vibrations.

NOTICE:

Protect the product against humidity, heat sources, and mechanical damage.

NOTICE:

Do not place heavy weights on the packed product.

Long-term storage

If the unit is stored more than six months, then the following apply:

- Before operating the unit after storage, it must be inspected with special attention to the seals and the cable entry.
- The impeller/propeller must be rotated every other month to prevent the seals from sticking together.

3 Product Description

3.1 Products included

Pump model	Standard	EX
7030.090		X
7030.180	X	
7035.090		X
7035.180	X	
7040.090		X
7040.180	X	

3.2 Pump design

Intended Use

The product is intended for moving wastewater, sludge, raw and clean water. Always follow the limits that are given in *Application limits* (page 69). If there is a question regarding the intended use of the equipment, then contact a Xylem representative before proceeding.



DANGER: Explosion/Fire Hazard

Special rules apply to installations in explosive or flammable atmospheres. Do not install the product or any auxiliary equipment in an explosive zone unless it is rated explosion-proof or intrinsically-safe. If the product is EN/ATEX-, MSHA- or FM-approved, then see the specific EX information in the Safety chapter before taking any further actions.

NOTICE:

Do NOT use the unit in highly corrosive liquids.

3.3 Parts

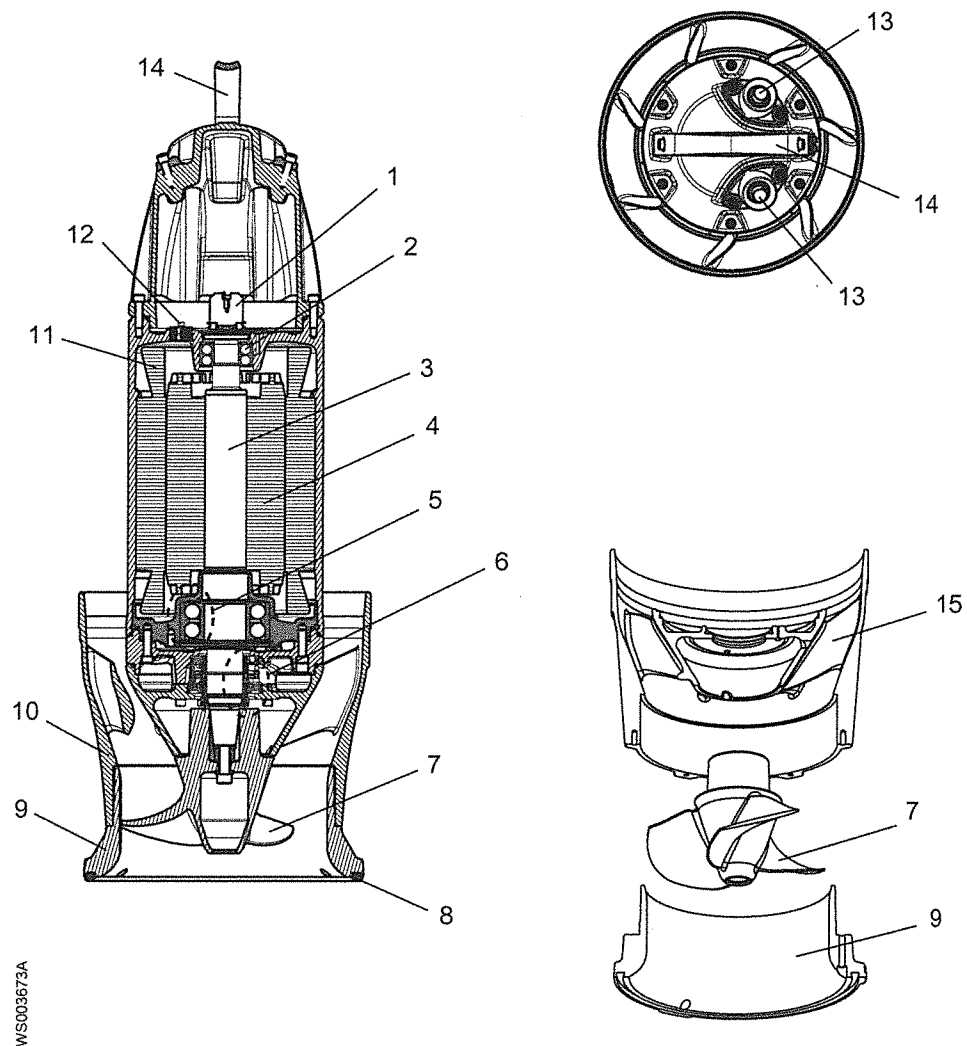


Figure 1: Section view, top view and exploded view of hydraulic parts.

Position	Part	Description
1	Terminal board	
2	Support bearing	Two-row ball bearing
3	Shaft	Stainless steel, with an integrated rotor
4	Rotor	
5	Main bearings	Two-row angular contact ball bearing in O-arrangement
6	Mechanical seals	Inner and outer mechanical seals
-	Seal housing	The housing acts as a buffer between the pumped fluid and the electric motor. It includes: <ul style="list-style-type: none"> • Inner and outer seals • An oil that lubricates the seals
7	Propeller	
8	Seal ring	
9	Bellmouth	With integrated relief groove
10	Pump housing	

Position	Part	Description
11	Stator	Equipped with temperature sensors in windings
12	Electrical lead-through unit	
13	Cable entry	
14	Lifting handle	
15	Guide vanes	

Spare part requirements

The following applies when servicing or repairing the pump:

- Modifications to the unit or installation should only be carried out after consulting with Xylem.
- Original spare parts and accessories that are authorized by Xylem are essential for compliance. The use of other parts can invalidate any claims for warranty or compensation. For more information, please contact your local sales and service representative.

3.4 The MAS 711 monitoring system

The MAS 711 monitoring equipment can be used with pump models P7030, P7035 and P7040, in applications using only one (1) motor cable. The motor cable must be screened.

Pumps with the standard MAS 711 equipment use a 12-lead auxiliary cable, plus 4 leads from the motor cable, for the following:

- Thermal switches for stator temperature monitoring (3 in series) or PTC-thermistors
- Leakage sensor in the inspection chamber
- Leakage sensor in the junction box
- Analogue temperature sensor (Pt100) for main bearing temperature monitoring
- Analogue temperature sensor (Pt100) for stator winding temperature in one phase
- Vibration sensor VIS10
- Analogue temperature sensor (Pt100) for support bearing temperature monitoring
- Pump memory

3.4.1 Sensors

Temperature sensors

Table 1: Thermal switch

Description	Measured value	Fault values
The thermal switch is a normally closed contact.	0-3 ohm, unless the wires are very long.	An infinite value (open circuit) indicates either high temperature or a fault (a wire is broken or there is a bad contact in a connector).

Table 2: PTC-thermistor

Description	Measured value	Fault values
The PTC-thermistor is a semiconductor device.	Resistance at normal temperature: <ul style="list-style-type: none"> • 50-100 ohm (150-300 ohm for three in series). 	<ul style="list-style-type: none"> • Above the tripping point, T_{Ref}, the resistance increases dramatically to several kohm. • An infinite value (open circuit) indicates a fault (a wire is broken or there is a bad contact in a connector). • A value close to zero indicates a short circuit in the wiring.

Table 3: Pt100 sensor

Description	Measured value	Fault values
The Pt100 sensor is a resistor changing value almost linearly with temperature.	Resistance: <ul style="list-style-type: none"> 100 ohm at 0°C (32°F) 107.79 ohm at room temperature (20°C, 68°F) 138.5 ohm at 100°C (212°F) For resistance data between 0–160 0°C (32–212°F), see <i>Pt100 resistance</i> (page 69). Never connect the Pt100 sensor to a voltage higher than 2.5 V.	> 200 ohm (approx.) can indicate the following situations: <ul style="list-style-type: none"> Broken sensor Bad contact Broken lead < 70 ohm (approx) indicates: <ul style="list-style-type: none"> Short circuit.

For information on the various configurations of switches, thermistors and sensors used to monitor stator winding temperature, see *Stator temperature monitoring methods* (page 13).

FLS

Table 4: Float switch sensor (FLS)

Description	Measured value	Fault values
The float switches are leakage sensors.	Resistance. 2 sensor variants: FLS: <ul style="list-style-type: none"> Normal: 1530 ohm Alarm: 330 ohm FLS 10: <ul style="list-style-type: none"> Normal: 1200 ohm Alarm: 430 ohm 	> 10% (approx.) deviation from rated ohm values indicates sensor fault, or fault in the wiring.

VIS10

Table 5: Vibration sensor (VIS10)

Description	Measured value	Fault values
The vibration sensor located in the junction box measures vibrations in one direction. The output is a 4-20 mA signal proportional to the vibration level.	Current, 4-20 mA	<ul style="list-style-type: none"> >> 20 mA indicates a short circuit. << 4 mA indicates a fault. A zero value indicates a broken wire or bad contact in a connector.

3.4.2 Stator temperature monitoring methods

The purpose of stator-winding temperature monitoring is to make the motor shut off at high temperature. There are two monitoring methods, depending on the types of thermal sensors chosen.

Table 6: Stator temperature monitoring configuration

Configuration with thermal switches	Configuration with thermistors
<ul style="list-style-type: none"> Three thermal switches, connected in series, are incorporated in the coil ends of the stator winding. The switches are normally closed, and open at 140°C (285°F). One Pt100 sensor is incorporated in one of the windings. 	<ul style="list-style-type: none"> Three thermistors, PTC, connected in series, are incorporated in the coil ends of the stator windings. $T_{Ref}=140^{\circ}\text{C}$ (285°F). One Pt100 sensor is incorporated in one of the windings.

By using an analogue sensor, two adjustable alarm limits can be used, one for warning ("B"-alarm) and one for pump stop ("A"-alarm).

3.4.3 Pump memory

The pump memory is located inside the junction box of the pump. The memory is loaded with data from the factory, which is then uploaded to the MAS system at first start-up.

The data that is uploaded contains the following features:

- Data plate information
- Sensor types and alarm settings recommended by the manufacturer
- Operational data and data to support service:
 - Histograms of temperatures, vibrations, and cycle length
 - Start and stop registration
 - Service log with a maximum of 200 lines of text
 - Conditions to prompt for service based on for example, running time, number of starts and stops or specific dates

For more information, see the MAS 711 Installation and User Manual.

3.5 The MiniCAS II monitoring equipment

The table below shows the parameters which can be tracked with the MiniCAS II monitoring system.

Parameter	Sensor	Standard or optional
Stator winding temperature	One of the following choices: <ul style="list-style-type: none"> • 3 thermal switches (standard), or • 3 PTC-thermistors (optional) 	Standard
Leakage in the inspection chamber	Float Switch Leakage Sensor (FLS)	Standard
Leakage in the junction box	Float Switch Leakage Sensor (FLS)	Optional

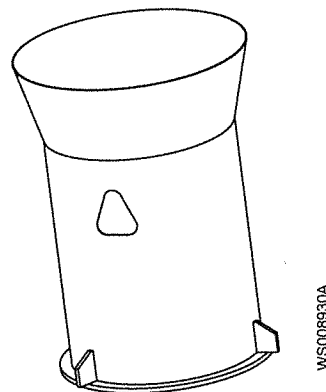
3.6 Column adapters

There are two accessories which can be used to install these pumps in slightly larger columns:

- Diffuser adapter
- Flange adapter

Diffuser adapter

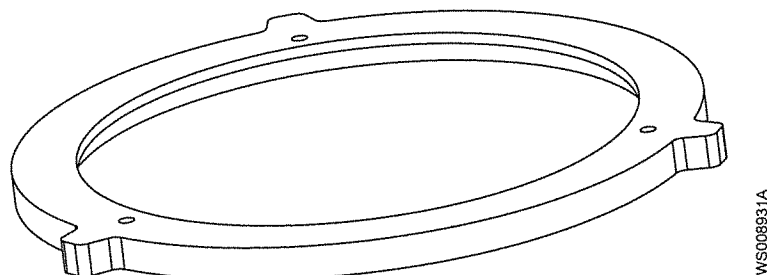
The diffuser adapter is lowered into the column before the pump is installed. No fastening is needed.



Pump	Diameter of Existing Column, mm (in)	Adapter Part Number
7030	800 (31.5)	769 73 21
	700 (27.6)	769 73 20

Pump		Diameter of Existing Column, mm (in)	Adapter Part Number
7035	Long motor	800 (31.5)	769 73 13
		700 (27.6)	769 73 12
	Short motor	800 (31.5)	769 73 11
		700 (27.6)	769 73 10
7040	Long motor	800 (31.5)	769 73 03
		700 (27.6)	769 73 02
	Short motor	800 (31.5)	769 73 01
		700 (27.6)	769 73 00

Flange adapter

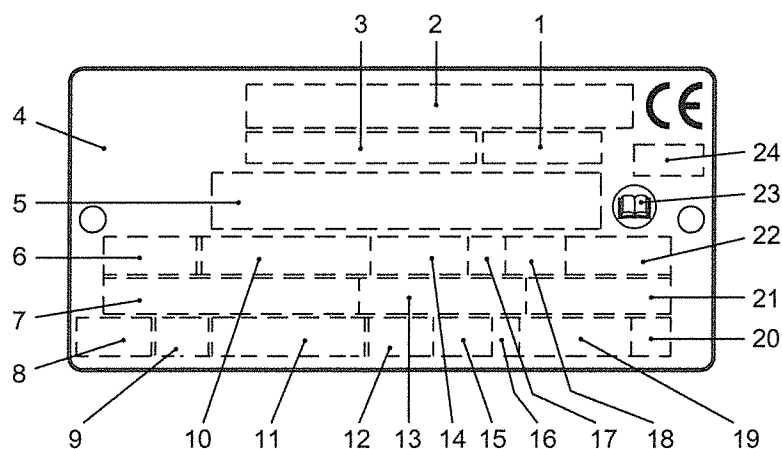


The flange adapter is bolted to the bottom of the specially-drilled bell mouth.

Pump	Diameter of Existing Column, mm (in)	Adapter Part Number
7030	800 (31.5)	773 75 21
7030	700 (27.6)	773 75 20
7035	800 (31.5)	773 75 11
7035	700 (27.6)	773 75 10
7040	800 (31.5)	773 75 01
7040	700 (27.6)	773 75 00

3.7 The data plate

The data plate is a metal label that is located on the main body of the products. The data plate lists key product specifications. Specially approved products also have an approval plate.



1. Curve code or Propeller code
2. Serial number
3. Product number
4. Country of origin


WS006257/A

5. Additional information
6. Phase; type of current; frequency
7. Rated voltage
8. Thermal protection
9. Thermal class
10. Rated shaft power
11. International standard
12. Degree of protection
13. Rated current
14. Rated speed
15. Maximum submergence
16. Direction of rotation: L=left, R=right
17. Duty class
18. Duty factor
19. Product weight
20. Locked rotor code letter
21. Power factor
22. Maximum ambient temperature
23. Read installation manual
24. Notified body, only for EN-approved Ex products

Figure 2: The data plate

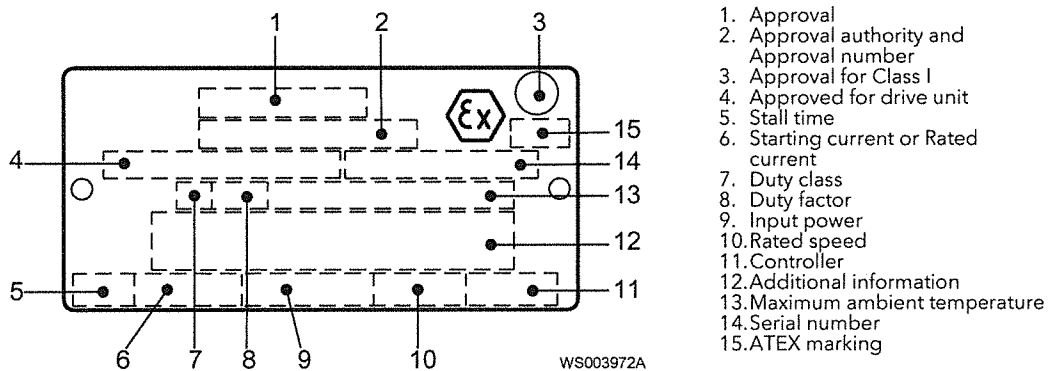
3.8 Approvals

Product approvals for hazardous locations

Pump	Approval
7030.090 7035.090 7040.090	<p>European Norm (EN)</p> <ul style="list-style-type: none"> • ATEX Directive • EN 60079-0:2012/A11:2013, EN 60079-1:2007, EN 13463-1:2009, EN 13463-5:2011 •  II 2 G c Ex d IIB T3 Gb <p>IEC</p> <ul style="list-style-type: none"> • IECEx scheme • IEC 60079-0, IEC 60079-1 • Ex d IIB T3 Gb <p>FM (FM Approvals)</p> <ul style="list-style-type: none"> • Explosion proof for use in Class I, Div. 1, Group C and D • Dust ignition proof for use in Class II, Div. 1, Group E, F and G • Suitable for use in Class III, Div. 1, Hazardous Locations <p>CSA Ex</p> <ul style="list-style-type: none"> • Explosion proof for use in Class I, Div. 1, Group C and D

EN approval plate

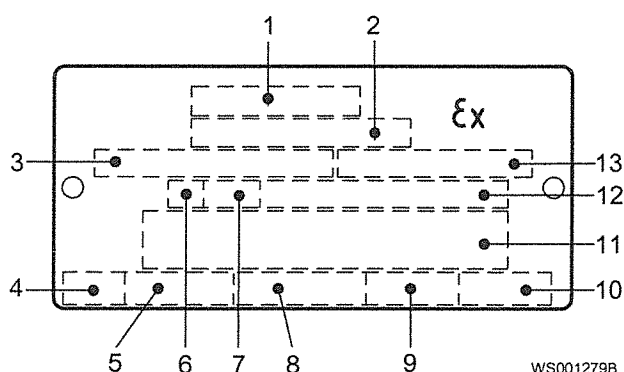
This illustration describes the EN approval plate and the information that is contained in its fields.



IEC approval plate

This illustration describes the IEC approval plate and the information that is contained in its fields.

International Norm; not for EU member countries.

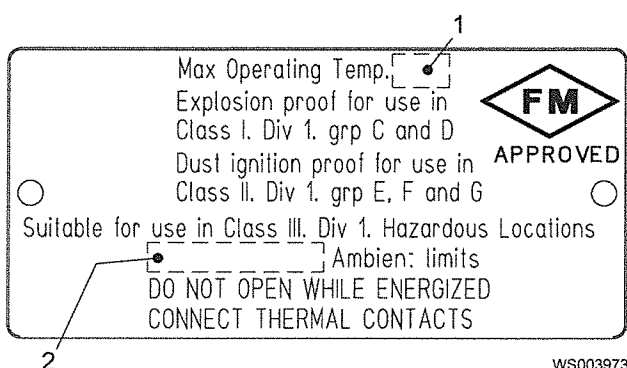


1. Approval
2. Approval authority and Approval number
3. Approved for drive unit
4. Stall time
5. Starting current or Rated current
6. Duty class
7. Duty factor
8. Input power
9. Rated speed
10. Controller
11. Additional information
12. Maximum ambient temperature
13. Serial number

WS001279B

FM approval plate

This illustration describes the FM approval plate and the information that is contained in its fields.

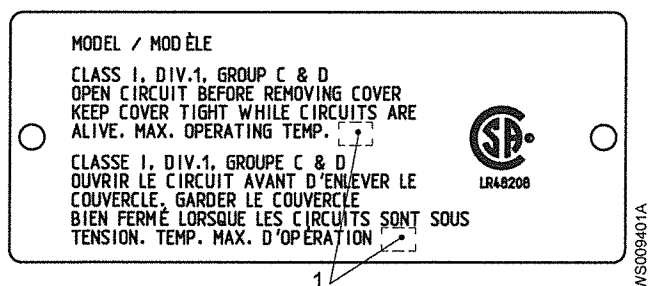


1. Temperature class
2. Maximum ambient temperature

WS003973A

CSA approval plate

This illustration describes the CSA approval plate and the information that is contained in its fields.



1. Temperature class

WS009401A

3.9 Product denomination

Reading instruction

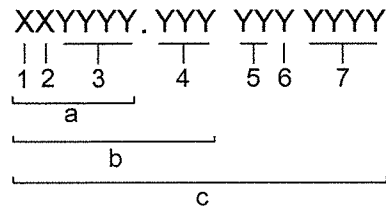
In this section, code characters are illustrated accordingly:

X = letter

Y = digit

The different types of codes are marked up with a, b and c. Code parameters are marked up with numbers.

Codes and parameters



WS006265B

Type of Callout	Number	Indication
Type of code	a	Sales denomination
	b	Product code
	c	Serial number
Parameter	1	Hydraulic end
	2	Type of installation
	3	Sales code
	4	Version
	5	Production year
	6	Production cycle
	7	Running number

4 Installation

4.1 Precautions

Before starting work, make sure that the safety instructions in the chapter *Introduction and Safety* (page 3) have been read and understood.



DANGER: Electrical Hazard

Before starting work on the unit, make sure that the unit and the control panel are isolated from the power supply and cannot be energized. This applies to the control circuit as well.



DANGER: Explosion/Fire Hazard

Special rules apply to installations in explosive or flammable atmospheres. Do not install the product or any auxiliary equipment in an explosive zone unless it is rated explosion-proof or intrinsically-safe. If the product is EN/ATEX-, MSHA- or FM-approved, then see the specific EX information in the Safety chapter before taking any further actions.



DANGER: Inhalation Hazard

Before entering the work area, make sure that the atmosphere contains sufficient oxygen and no toxic gases.

Before installing the pump, do the following:

- Provide a suitable barrier around the work area, for example, a guard rail.
- Make sure that equipment is in place so that the unit cannot roll or fall over during the installation process.
- Check the explosion risk before you weld or use electric hand tools.
- Check that the cable and cable entry have not been damaged during transport.
- Always remove all debris and waste material from the sump before you install the pump.

Hazardous atmospheres



DANGER: Explosion/Fire Hazard

Special rules apply to installations in explosive or flammable atmospheres. Do not install the product or any auxiliary equipment in an explosive zone unless it is rated explosion-proof or intrinsically-safe. If the product is EN/ATEX-, MSHA- or FM-approved, then see the specific EX information in the Safety chapter before taking any further actions.



WARNING: Explosion/Fire Hazard

Do not install CSA-approved products in locations that are classified as hazardous in the National Electric Code(TM), ANSI/NFPA 70-2005.

Authority regulation

Vent the tank of a sewage station in accordance with local plumbing codes.

Falling

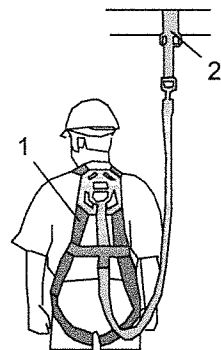


CAUTION: Fall Hazard

Slips and falls can cause severe injuries. Watch your step.

To minimize the risk of falling, observe the following:

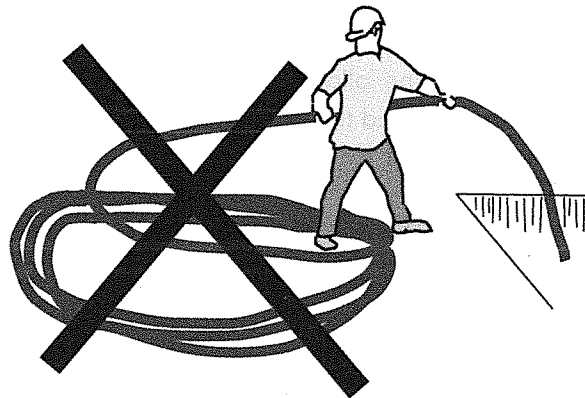
- Use appropriate personal protection equipment when working in or near shafts, pits or trenches.



WS004361B

1. Fall protection harness
2. Anchoring point

- Make sure that all safety guards are in place and secure, and that there is a suitable barrier around the work area.
- Wear clean slip-resistant shoes.
- Make sure that any ladders or climbing equipment that is used is correctly sized and in good working condition.
- Never stand in coiled cables, ropes or wires, or between them and the open shaft or pit.



WS004315C

Fasteners

- Only use fasteners of the correct size and material.
- Replace all corroded or damaged fasteners.
- Make sure that all the fasteners are correctly tightened and that there are no missing fasteners.

4.2 Requirements for the cable handling system

When the pump is installed in a discharge tube, it is critically important that a proper cable support and protection system is used, especially with long power cables and closed discharge tubes.

Checklist

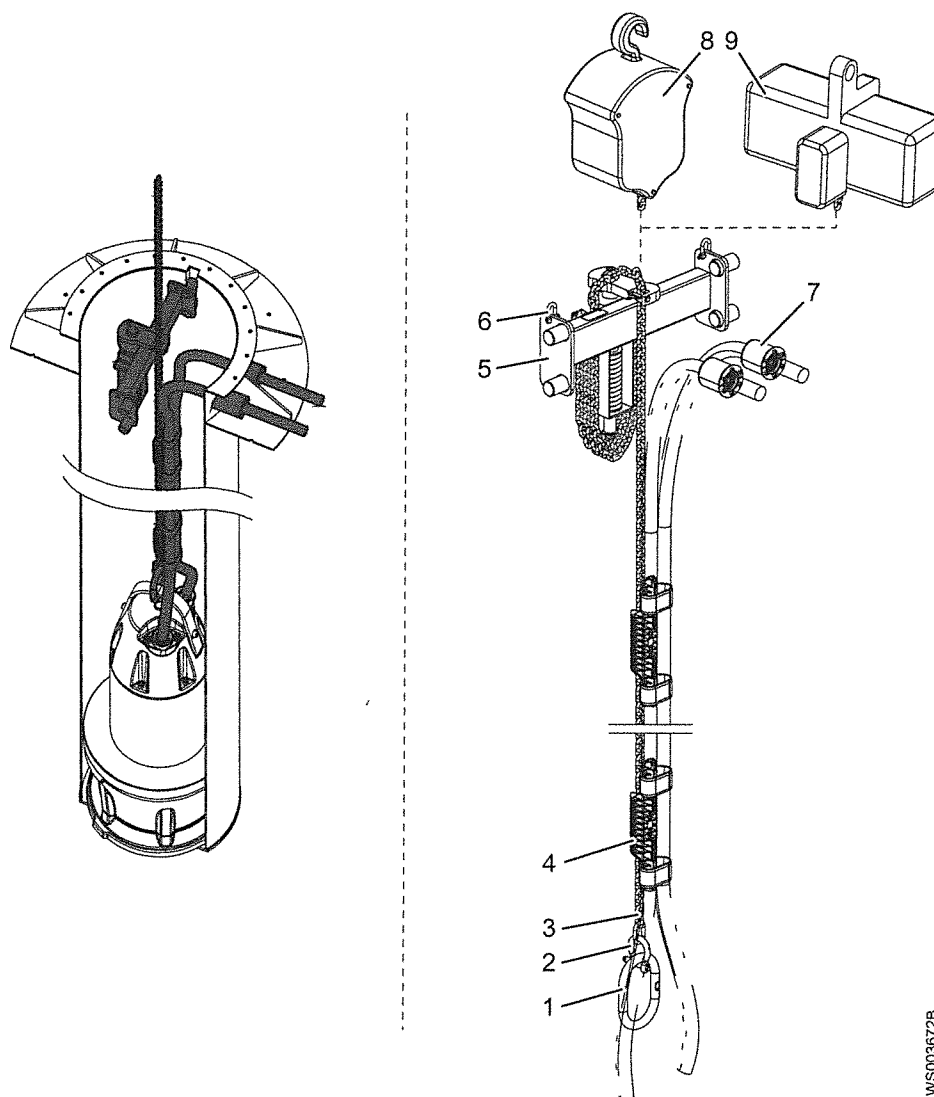
This table shows the requirements to be fulfilled by the cable handling system.

Requirement	Check
Cables must be supported in such a way, so that they do not come in contact with any hard surface which could abrade the cable sheathing. Examples of surfaces include pump and tube components, lifting cables or wires and any other hardware.	
Cables should be bundled together, using components that will not cut or abrade the cables.	

Requirement	Check
Proper strain relief and support at prescribed intervals should be provided.	
Spring-controlled tensioning and an integrated guide wire system is recommended for long cables, to protect the cable from movement which can cause damage.	

The Flygt Lift & Cable Handling System

The following figure shows major parts of the optional Flygt Lift & Cable Handling System, designed for this pump.



1. Eye
2. Shackle
3. Chain sling
4. Cable holder unit
5. Console
6. Shackle
7. Motor cable entrance unit
8. Optional block and tackle, manually operated
9. Optional block and tackle, electrically operated

WS003672B

Instructions for installing the cable handling system

Instructions for installing the Flygt Lift & Cable Handling System are given in the document "Installation, Operation and Maintenance, Flygt Lift & Cable Handling System". For more information, contact your local Xylem representative.

4.3 Install the diffuser adapter

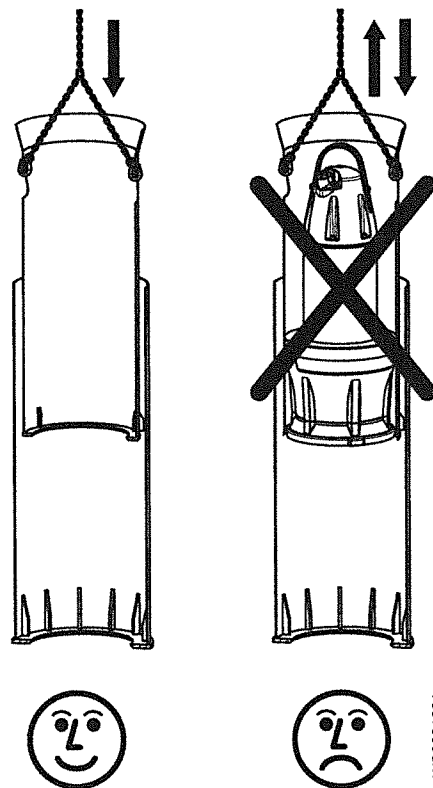
Necessary equipment:

- Lifting chain with two hooks. See the illustration.

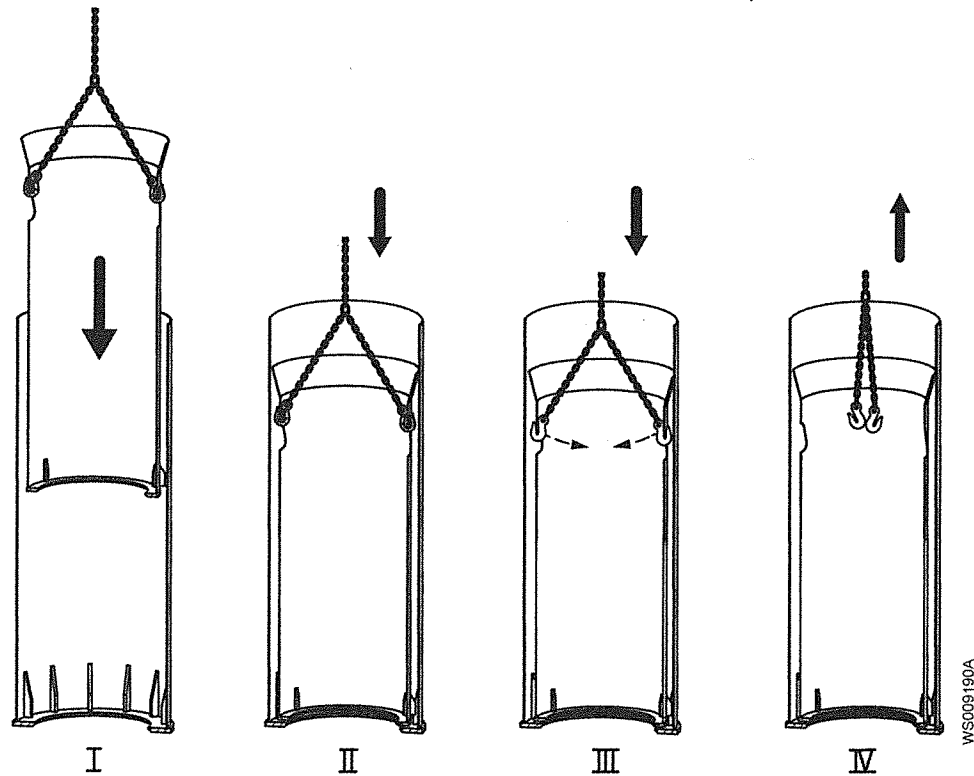


This procedure is only required when a diffuser adapter is used to adapt a wider column pipe to a more narrow pump. See *Column adapters* (page 14).

1. Put the two lifting hooks through the triangular holes of the adapter, from the inside.
2. Lift the adapter, without the pump.



3. Lower the adapter into the column, until it bottoms out on the bottom of the column.
4. Lower the lifting chain further until the hooks fall out of the triangular holes. Remove the lifting arrangement.



Install the pump. See *Install the pump* (page 23).

4.4 Install the pump

Consult the nearest Xylem representative regarding the following topics:

- Sizing of the pump, piping station, and access frame
- Choice of auxiliary equipment
- Other aspects of installation



DANGER: Explosion/Fire Hazard

Special rules apply to installations in explosive or flammable atmospheres. Do not install the product or any auxiliary equipment in an explosive zone unless it is rated explosion-proof or intrinsically-safe. If the product is EN/ATEX-, MSHA- or FM-approved, then see the specific EX information in the Safety chapter before taking any further actions.



WARNING: Explosion/Fire Hazard

Before starting any permit-required hot work such as welding, gas cutting, grinding, or using electrical handtools, do the following: 1. Check the explosion risk. 2. Provide sufficient ventilation.



WARNING: Fall Hazard

Check that suitable barriers for the work area are in place.



WARNING: Electrical Hazard

Risk of electrical shock or burn. A certified electrician must supervise all electrical work. Comply with all local codes and regulations.



WARNING: Crush Hazard

Make sure that the unit cannot roll or fall over and injure people or damage property.

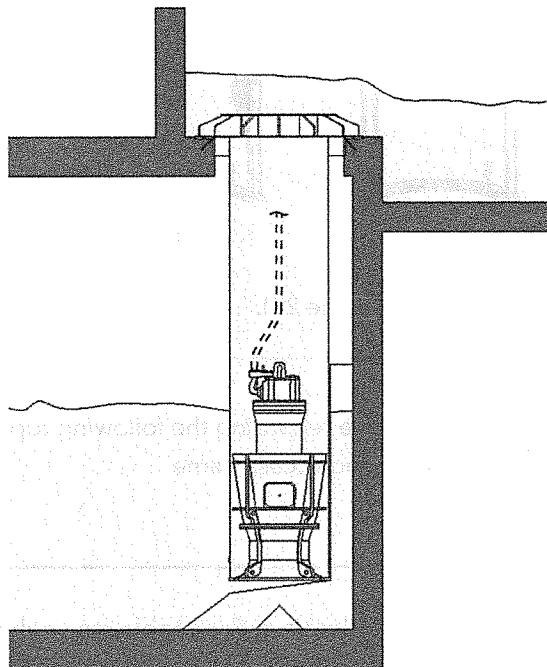
NOTICE:

Do not run the pump dry.

NOTICE:

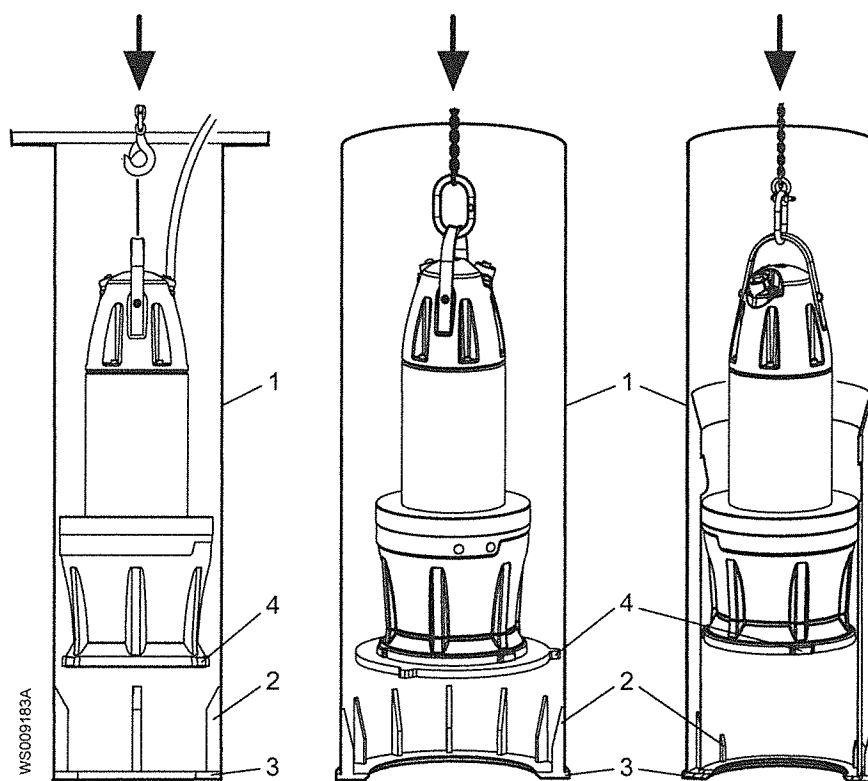
Never force piping to make a connection with a pump.

The pump is usually installed in a vertical discharge tube on a pump seat, which is incorporated in the lower end of the tube. No anchoring is required because the weight of the pump is sufficient to keep it in place. The pumps are equipped with anti-rotation devices.



WS001675A

Figure 3: Pump in the discharge tube. A generic propeller pump is shown.



- WS009183A
1. Discharge column
 2. Antirotation gusset (stop vanes)
 3. Pump seat
 4. Anti-rotation device on hydraulic end

Figure 4: Without adapter, with flange adapter, and with diffuser adapter

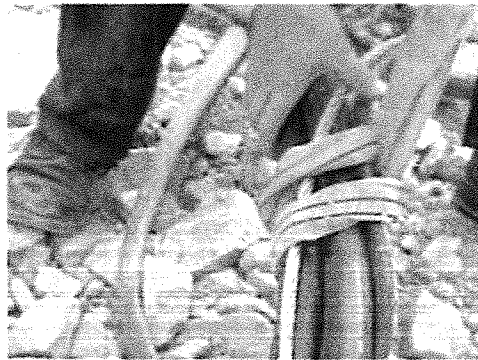
When the pump is installed in a discharge tube, the following must be considered:

- A suitable cable support and protection system must be used.

Before installation, check the following:

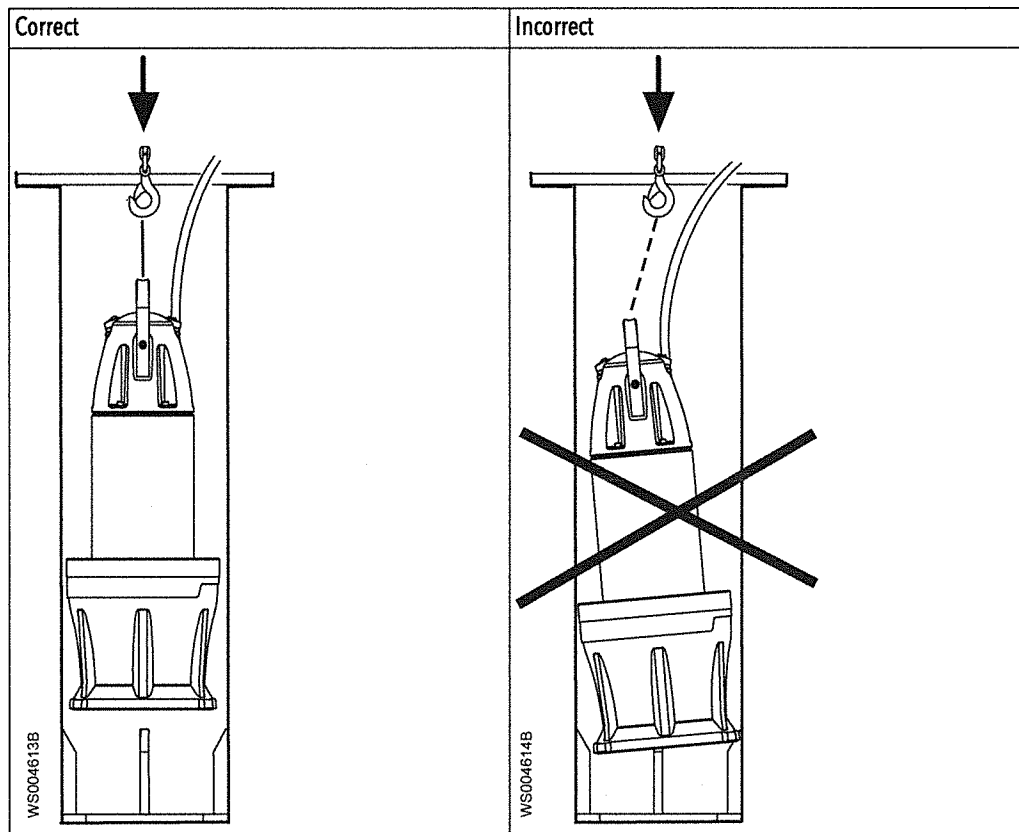
- The rubber seal ring underneath the pump is in place.
 - There is no damage to, or debris on, the pump seat.
 - There is no large construction debris under the pump tube. If debris is present, then there is a risk that it gets sucked into the pump and cause propeller damage.
1. Make sure that the pump control is set to turn off the pump at or above the minimum operating water level for this pump installation.
 2. If a diffuser adapter will be used at the site, then make sure that the adapter is in place. See *Install the diffuser adapter* (page 22).
 3. Check that the cables and cable entries have not been damaged during transport.
 4. Secure the cables so that they can be fed into the column in a controlled manner.

When the pump is lowered into the column, the cables must be fed into the column at the same speed as the pump is lowered.



WS006791A

5. After cable preparation, lower the pump into the pump column.
Make sure that the pump does not tilt on the stop vanes, which are at the bottom of the column.



6. Lower the pump to its bottom position, at the same time carefully moving it back and forth between the nearest anti-rotation gusset.

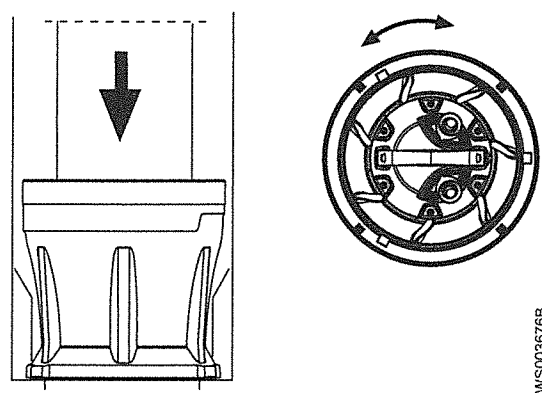


Figure 5: Lower the pump while moving between anti-rotation gussets

7. Lift the pump slightly again, approximately 2-3 cm (1 in). Turn it counterclockwise until the anti-rotation device on the hydraulic end lands against the nearest adjacent vanes.

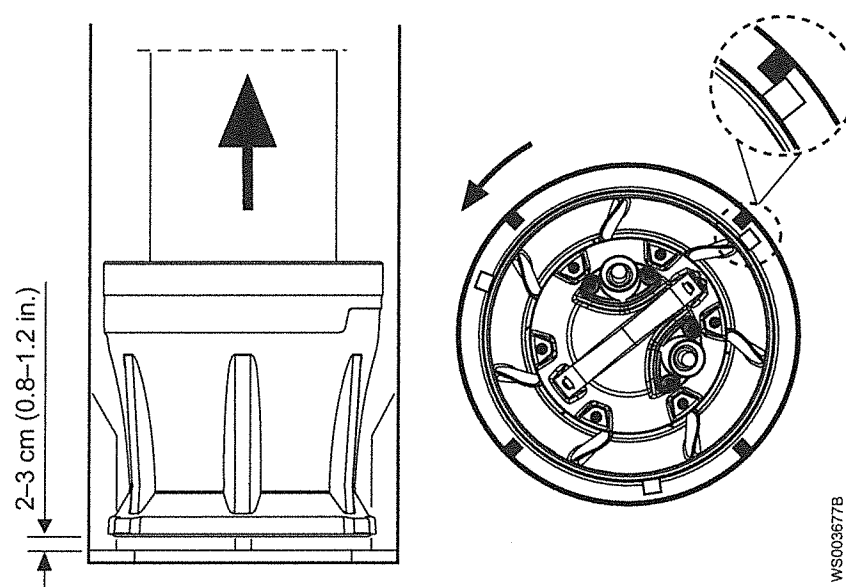


Figure 6: Turn the pump until the anti-rotation device is in place.

8. Lower the pump to its final bottom position.
No more anchoring of the pump is required. Maximum permissible submersion depth is 20 m (65 ft).

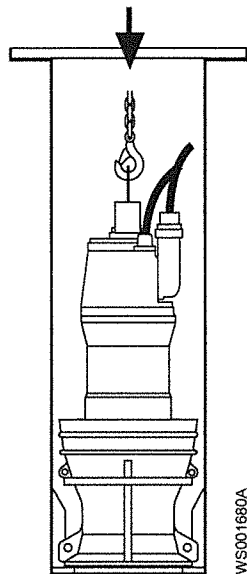


Figure 7: Lower the pump to its final bottom position. A generic propeller pump is shown.

9. If the recommended cable handling system is used, then follow the instructions to finish the cable connection. See the document "Installation, Operation and Maintenance, Flygt Lift and Cable Handling System."
10. If the recommended cable handling system is not used, then fasten the power cables on the cable holder and run them to the electric junction box.

Make sure that the cables have no sharp bends, are not pinched, and do not disturb the water flow.

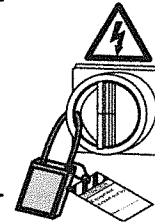
4.5 Make the electrical connections

General precautions



DANGER: Electrical Hazard

Before starting work on the unit, make sure that the unit and the control panel are isolated from the power supply and cannot be energized. This applies to the control circuit as well.



WARNING: Electrical Hazard

Risk of electrical shock or burn. A certified electrician must supervise all electrical work. Comply with all local codes and regulations.



WARNING: Electrical Hazard

There is a risk of electrical shock or explosion if the electrical connections are not correctly carried out, or if there is fault or damage on the product. Visually inspect equipment for damaged cables, cracked casings or other signs of damage. Make sure that electrical connections have been correctly made.



WARNING: Crush Hazard

Risk of automatic restart.

**CAUTION: Electrical Hazard**

Prevent cables from becoming sharply bent or damaged.

NOTICE:

Leakage into the electrical parts can cause damaged equipment or a blown fuse. Keep the cable ends dry at all times.

Requirements

These general requirements apply for electrical installation:

- The supply authority must be notified before installing the pump if it will be connected to the public mains. When the pump is connected to the public power supply, it may cause flickering of incandescent lamps when started.
- The mains voltage and frequency must agree with the specifications on the data plate. If the pump can be connected to different voltages, then the connected voltage is specified by a yellow sticker close to the cable entry.
- The fuses and circuit breakers must have the proper rating, and the pump overload protection (motor protection breaker) must be connected and set to the rated current according to the data plate and if applicable the cable chart. The starting current in direct-on-line start can be up to six times higher than the rated current.
- The fuse rating and the cables must be in accordance with the local rules and regulations.
- If intermittent operation is prescribed, then the pump must be provided with monitoring equipment supporting such operation.

Cables

These are the requirements to follow when you install cables:

- The cables must be in good condition, not have any sharp bends, and not be pinched.
- The cables must not be damaged and must not have indentations or be embossed (with markings, etc.) at the cable entry.
- The minimum bending radius must not be below the accepted value.
- The voltage drop in long cables must be taken into account. The drive unit's rated voltage is the voltage measured at the cable connection point in the pump.
- For SUBCAB® cables, the twisted pair copper foil must be trimmed.
- All unused conductors must be insulated.

Grounding (earthing)

Grounding (earthing) must be done in compliance with all local codes and regulations.

**DANGER: Electrical Hazard**

All electrical equipment must be grounded (earthed). Test the ground (earth) lead to verify that it is connected correctly and that the path to ground is continuous.

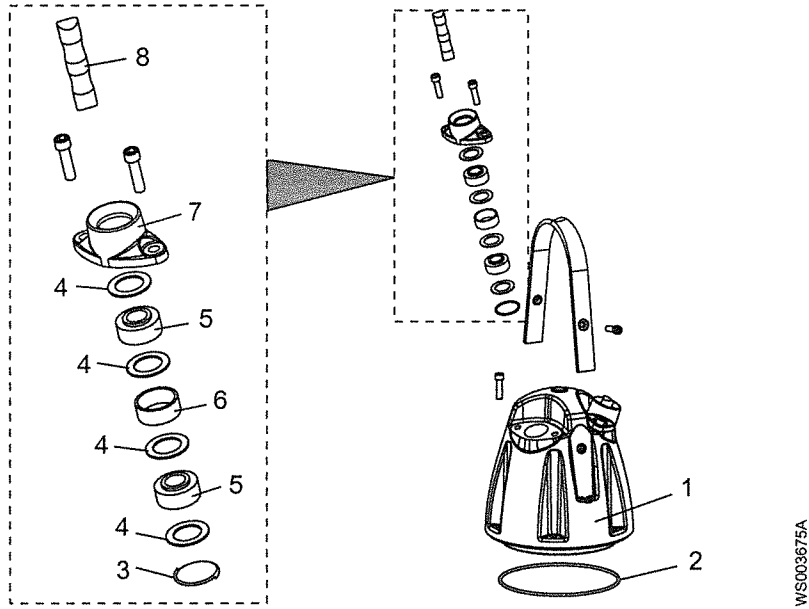
**WARNING: Electrical Hazard**

If the power cable is jerked loose, then the ground (earth) conductor must be the last conductor to come loose from its terminal. Make sure that the ground (earth) conductor is longer than the phase conductors at both ends of the cable.

**WARNING: Electrical Hazard**

Risk of electrical shock or burn. You must connect an additional ground- (earth-) fault protection device to the grounded (earthed) connectors if persons are likely to come into contact with liquids that are also in contact with the pump or pumped liquid.

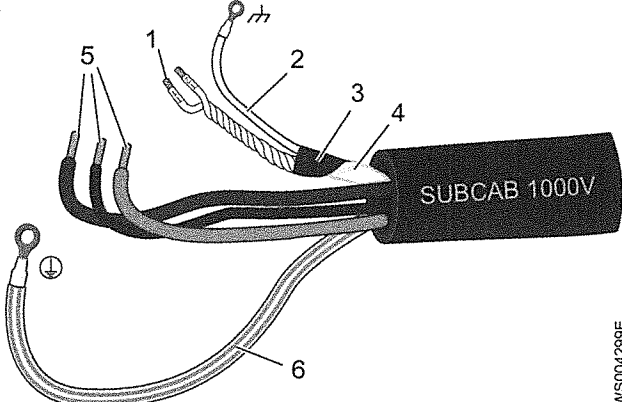
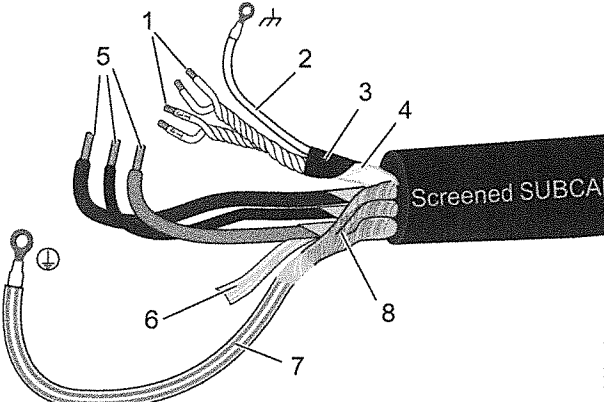
4.5.1 Cable entry parts



Position	Part
1	Entrance cover
2	O-ring
3	O-ring
4	Washer
5	Seal sleeve
6	Spacer ring
7	Entrance flange
8	Cable

4.5.2 Prepare the SUBCAB® cables

This section applies to SUBCAB® cables with twisted-pair control cores.

The prepared SUBCAB® cable	The prepared screened SUBCAB® cable
 <p>1. T1+T2 twisted pairs in control element 2. Drain wire in control element (bare copper wire) 3. Screened copper pt-foil 4. Insulation sheath (jacket) or PT-foil for control element 5. Power cores 6. Ground (earth) core</p> <p>WS004296E</p>	 <p>1. T1+T2 and T3+T4 twisted pairs in control element 2. Drain wire in control element (bare copper wire) 3. Screened copper pt-foil 4. Insulation sheath (jacket) for control element 5. Power cores 6. Aluminum foil 7. Ground (earth) core with green/yellow shrink hose 8. Uncovered screen/braided wire</p> <p>WS004296C</p>

1. Peel off the outer sheath at the end of the cable.
2. Prepare the control element:
 - a) Peel the sheath (if applicable) and the copper foil.

The copper foil is a screen and is conductive. Do not peel more than necessary, and remove the peeled foil.

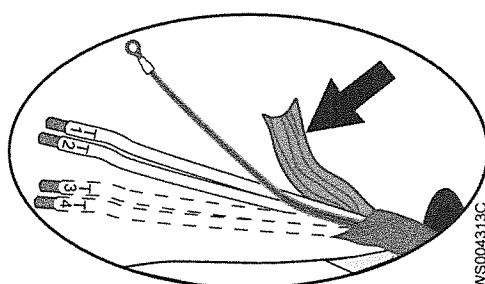


Figure 8: Copper foil on control element.

- b) Put a white shrink hose over the drain wire and the cable terminal.
 - c) Fit a cable lug on the drain wire.
 - d) Twist T1+T2 and T3+T4.
 - e) Put a shrink hose over the control element.

Make sure that the conductive copper foil and drain wire is covered.
3. Prepare the ground (earth) core for SUBCAB™ cable:
 - a) Peel the yellow-green insulation from the ground (earth) core.
 - b) Check that the ground (earth) core is at least 10% longer than the phase cores in the cabinet.
 - c) If applicable, put a cable lug on the ground core.
4. Prepare the ground (earth) core for screened SUBCAB™ cable:
 - a) Untwist the screens around the power cores.
 - b) Put a yellow-green shrink hose over the ground (earth) core.

Leave a short piece uncovered.

 - c) If applicable, put a cable lug on the screened ground core.

- d) Twist all power core screens together to create a ground (earth) core and fit a cable terminal to the end.
- e) Check that the ground (earth) core is at least 10% longer than the phase cores in the cabinet.
5. How is the connection to ground (earth) made?
 - Screw: Fit cable terminals to the ground (earth) core and the power cores.
 - Terminal block: Leave the core ends as they are.
6. Prepare the main leads:
 - a) Remove the aluminum foil around each power core.
 - b) Peel the insulation from each power core.

4.5.3 Connect the SUBCAB cable to the pump

NOTICE:

Leakage into the electrical parts can cause damaged equipment or a blown fuse. Keep the end of the motor cable dry at all times.

For more information about the cable entry, see the Parts list.

1. Remove the entrance cover and the O-ring from the stator housing.
This provides access to the terminal board.
2. Check the data plate to see which connections are required for the power supply.
3. Arrange the connections on the terminal board in accordance with the required power supply.
Links (jumper strips) are not used with the Y/D start.
4. Connect the mains leads (L1, L2, L3, and ground (earth)) according to the applicable cable chart.
The ground (earth) lead must be 120 mm (4.8 in.) longer than the phase leads in the junction box of the unit.
5. Make sure that the pump is correctly connected to ground (earth).
6. Connect the control leads to the applicable terminal board, and twist the leads together.
7. Make sure that any thermal contacts incorporated in the pump are properly connected to the terminal board.
8. Install the entrance cover and the O-ring on the stator housing.
9. Fasten the screws on the entrance flange so that the cable insertion assembly bottoms out.

4.5.4 Connect the SUBCAB cable to the starter and MiniCAS monitoring equipment

If there are two power cables, then the cable that is connected to T1 and T2 is labeled. If a separate control cable is used, then the control leads in the power cable are never connected.



DANGER: Explosion/Fire Hazard

Special rules apply to installations in explosive or flammable atmospheres. Do not install the product or any auxiliary equipment in an explosive zone unless it is rated explosion-proof or intrinsically-safe. If the product is EN/ATEX-, MSHA- or FM-approved, then see the specific EX information in the Safety chapter before taking any further actions.

NOTICE:

Either thermal contacts or thermistors are incorporated in the pump.

NOTICE:

Thermal contacts must never be exposed to voltages higher than 250 V, breaking current maximum 5 A. It is recommended that they are connected to 24 V over separate fuses to protect other automatic equipment.

1. If thermal contacts are included in the pump installation, then connect the T1 and T2 control conductors to the MiniCAS II monitoring equipment. Twist the monitoring wires together.
2. If thermistors are included in the pump installation, and screened or auxiliary cable is used, then connect T1(1) and T2(2) to thermistor relay, and T3(3) and T4 (4) to MiniCAS II.
3. Connect the mains leads (L1, L2, L3, and ground (earth)) to the starter equipment.
For information about the phase sequence and the color codes of the leads, see *Cable charts* (page 35).
4. Check the functionality of the monitoring equipment:
 - a) Check that the signals and the tripping function work properly.
 - b) Check that the relays, lamps, fuses, and connections are intact.
 Replace any defective equipment.

4.5.5 Connect the SUBCAB cables to the starter and MAS 711 monitoring equipment

This section provides connections for MAS 711 using 12-lead sensor cable and four power cable leads. It is applicable to pump models 7030, 7035 and 7040, with one screened motor cable.

This configuration requires screened cables.

The T1-T4 leads are used only for pump memory.

1. Connect the sensors as shown in the following figure and tables.

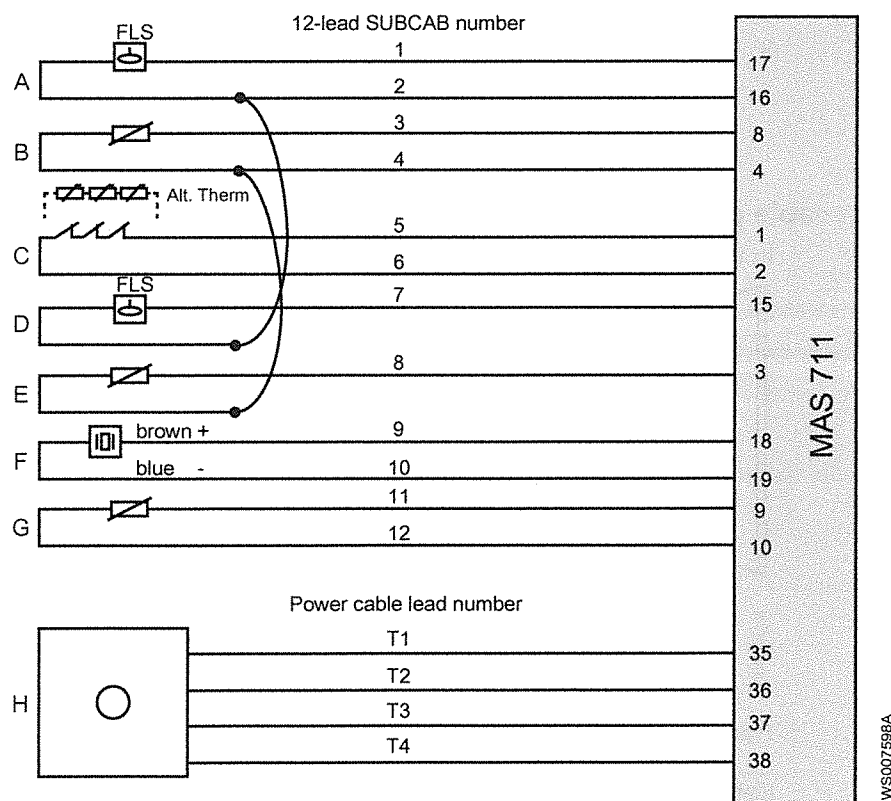


Figure 9: Connection for MAS 711 using 12-lead sensor cable and power cable leads

Item	Description	Connection
A	Inspection chamber leakage	12-lead sensor cable
B	Main bearing, Pt100	12-lead sensor cable
C	Stator winding, thermal switches	12-lead sensor cable
D	Junction box leakage	12-lead sensor cable
E	Stator winding 1, Pt100	12-lead sensor cable
F	Vibration, VIS10	12-lead sensor cable
G	Support bearing, Pt100	12-lead sensor cable
H	Pump memory	Power cable sensor leads

Table 7: Pump memory

Power Cable Lead Number	Description
T1	Supply 12V +
T2	Supply, ground
T3	RS485A
T4	RS485B

Table 8: Vibration, VIS10

12-lead SUBCAB Number	Color
9	Brown, +
10	Blue, -

2. Connect the mains leads (L1, L2, L3, and ground (earth)) to the starter equipment.
For information about the phase sequence and the color codes of the leads, see *Cable charts* (page 35).
3. Check the functionality of the monitoring equipment:
 - a) Check that the signals and the tripping function work properly.
 - b) Check that the relays, lamps, fuses, and connections are intact.
 Replace any defective equipment.

4.5.6 Power cable phase sequence

In the following figure, the triangle marked "L1," "L2" and "L3" shows the phase sequence.

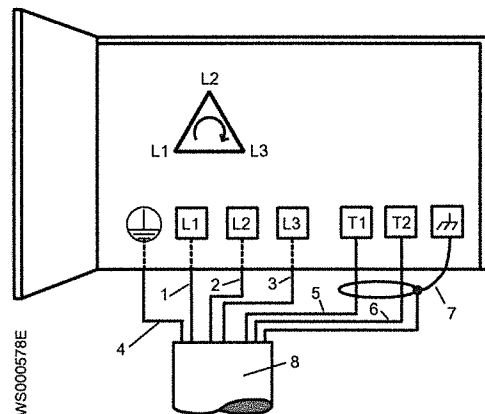


Figure 10: Correct phase sequence

Item	Description	
1	L1 cable lead	Brown
2	L2 cable lead	Black

Item	Description	
3	L3 cable lead	Gray
4	Earth PE or ground lead cable	
5	T1 cable lead (control element)	In cables with both power cores and control element.
6	T2 cable lead (control element)	In cables with both power cores and control element.
7	Screen (drain wire)	
8	Power cable to unit	

4.5.7 Cable bending radius, weight and diameter

Table 9: SUBCAB®

Cable	Minimum bending radius in mm	Weight in kg/m	Outer diameter, minimum-maximum in mm
4G4 + 2x1.5	200	0.63	Ø 20.0-22.0
4G6 + 2x1.5	240	0.83	Ø 24-26
4G10 + S(2x0.5)	240	0.85	Ø 24-26
4G16 + S(2x0.5)	260	1.13	Ø 26-28
4G25 + S(2x0.5)	320	1.70	Ø 32-34
4G35 + S(2x0.5)	350	2.24	Ø 35-37
3x50 + 2G35/2 + S(2x0.5)	350	2.6	Ø 35-37
3x70 + 2G35/2 + S(2x0.5)	380	3.3	Ø 38-41

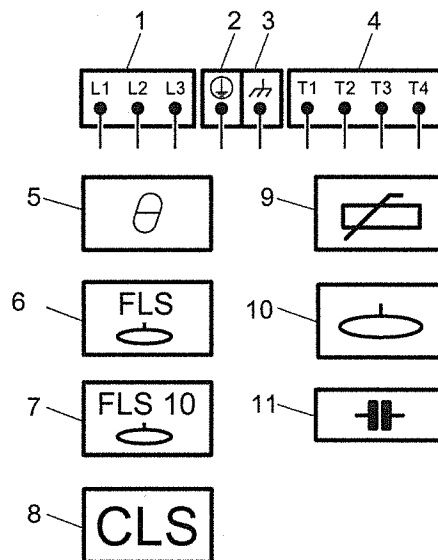
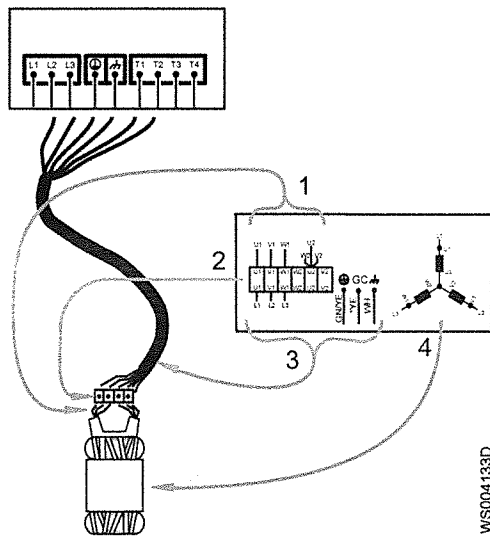
Table 10: SUBCAB® screened cables

Cable	Minimum bending radius in mm	Weight in kg/m	Outer diameter, minimum-maximum in mm
S3x6 + 3x6/3 + S(4x0.5)	200	0.55	Ø 20-22
S3x10 + 3x10/3 + S(4x0.5)	240	0.95	Ø 24-26
S3x16 + 3x16/3 + S(4x0.5)	240	1.1	Ø 24-26
S3x25 + 3x16/3 + S(4x0.5)	290	1.4	Ø 29-31
S3x35 + 3x16/3 + S(4x0.5)	320	2.0	Ø 32-34
S3x50 + 3x25/3 + S(4x0.5)	380	3.0	Ø 38-40
S3x70 + 3x35/3 + 2 S(2x0.5)	420	3.5	Ø 42-44




4.6 Cable charts

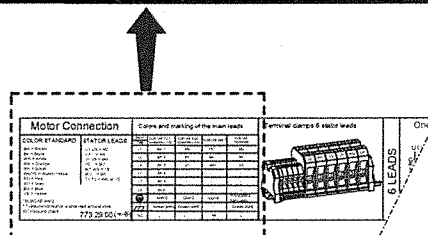
Connection locations

The figures in this section illustrate how to interpret the connection strip symbols.



4.6.1 Colors and markings of leads

Motor Connection		Colors and marking of the main leads				
COLOR STANDARD BN = Brown BK = Black WH = White OG = Orange GN = Green GN/YE = Green-Yellow RD = Red GY = Grey BU = Blue YE = Yellow *SUBCAB AWG ** Ground conductor is stranded around core GC=Ground check	STATOR LEADS U1,U5 = RD U2 = GN V1,V5 = BN V2 = BU W1,W5 = YE W2 = BK T1,T2 = WH or YE 773 29 00 (REV6)	Mains	SUBCAB 7GX Screenflex 7GX	SUBCAB 4GX Screenflex 4GX	SUBCAB AWG	SUBCAB Screened
		3 				
		L1	BK 1	BN	RD	BN
		L2	BK 2	BK	BK	BK
		L3	BK 3	GY	WH	GY
		L1	BK 4	-	-	-
		L2	BK 5	-	-	-
		L3	BK 6	-	-	-
			GN/YE	GN/YE	GN/YE	**Screen/PE from cores
			Screen (WH)	Screen (WH)	-	Screen (WH)
		GC	-	-	YE	-



WS004551D

See *Color code standard* (page 37).

Color code standard

Code	Description
BN	Brown
BK	Black
WH	White
OG	Orange
GN	Green
GNYE	Green-Yellow
RD	Red
GY	Grey
BU	Blue
YE	Yellow

4.6.2 Motor connection

See the data plate for the applicable connection diagram.

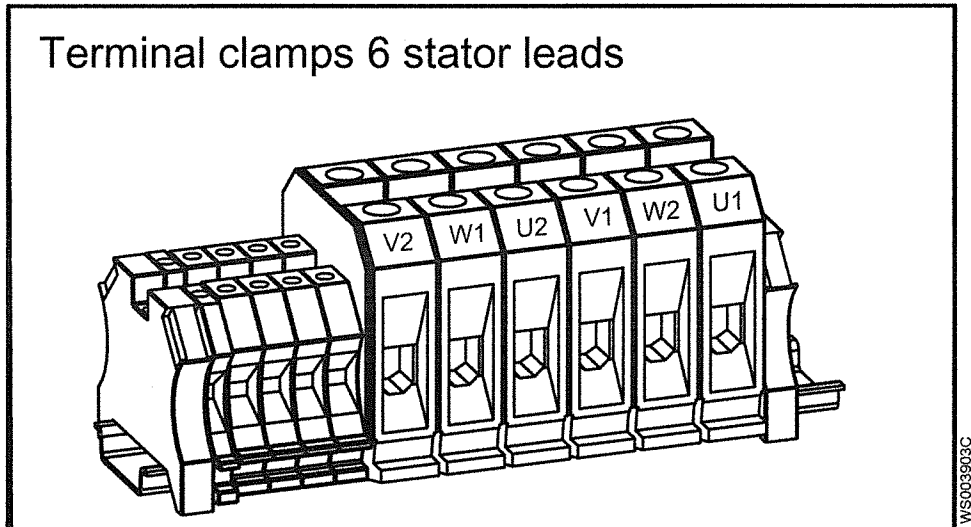
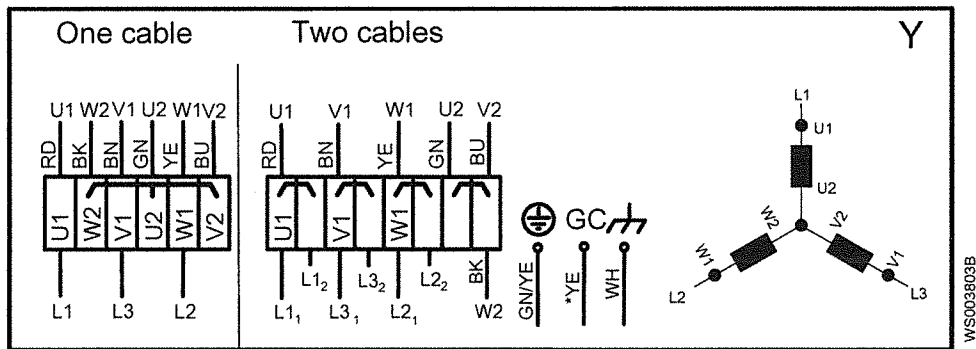


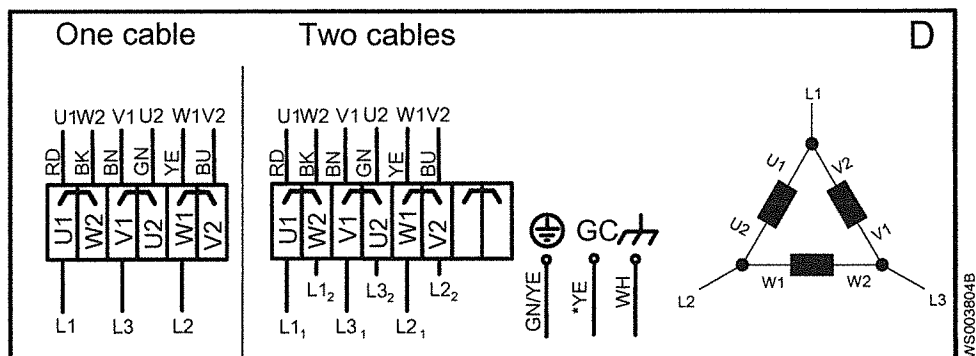
Figure 11: Terminal clamps, 6 stator leads

6 leads

One cable (left) and two cables (right) Y-connection. Applicable to: 4-50 mm².

Figure 12: Y-connection, 4-50 mm²

One cable (left) and two cables (right) D-connection. Applicable to: 4-50 mm².

Figure 13: D-connection, 4-50 mm²

Only for one cable, Y- and D-connection. Applicable to: 70 mm².

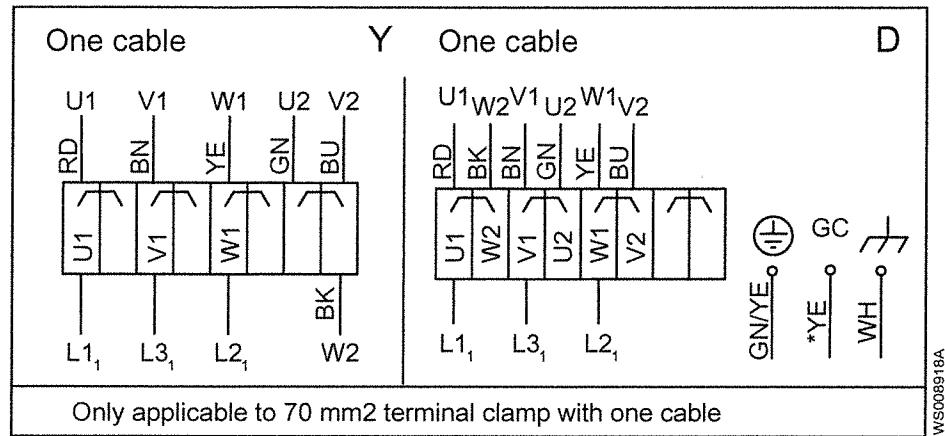


Figure 14: Y- and D-connection, 70 mm²

One cable (left) and two cables (right) D-connection. Applicable to: 95-120 mm².

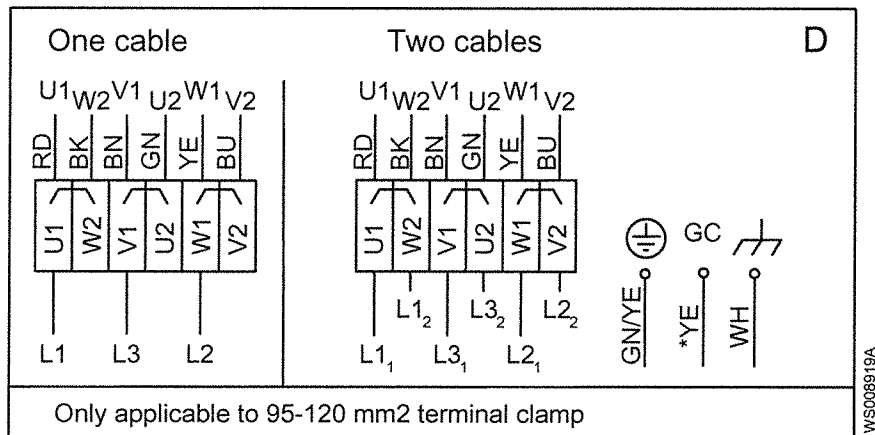


Figure 15: D-connection, 95-120 mm²

One cable (left) and two cables (right) Y/D-connection.

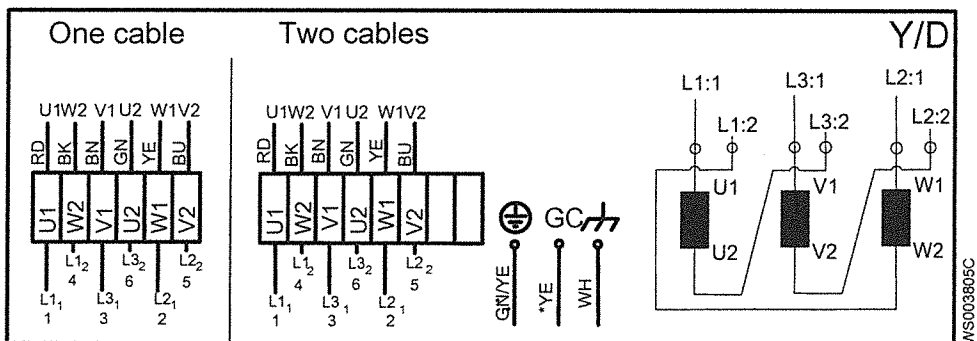


Figure 16: Y/D-connection

9 leads

One cable (left) and two cables (right) Y-parallel connection. Not applicable with P7035 or P7040.

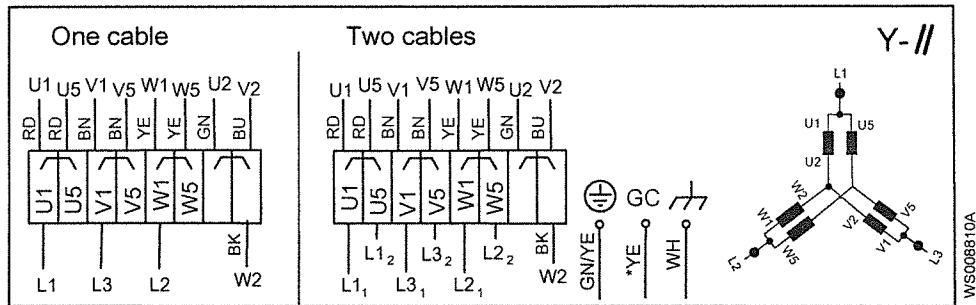


Figure 17: Y-parallel connection: P7030 only

One cable (left) and two cables (right) Y-serial connection. Not applicable with P7035 or P7040.

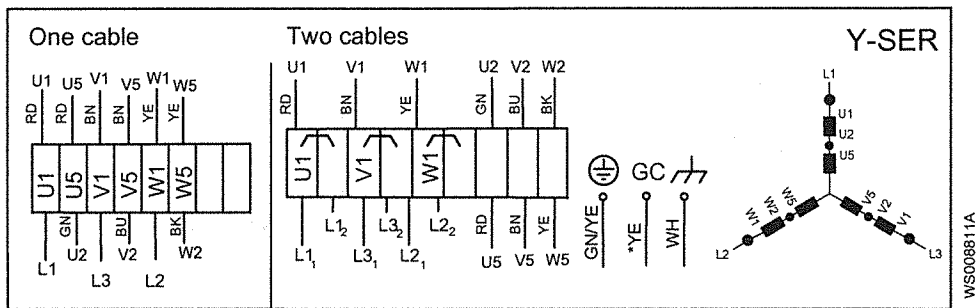


Figure 18: Y-serial connection: P7030 only

Screened cables

Cable without separate ground conductor. Screen as ground conductor.

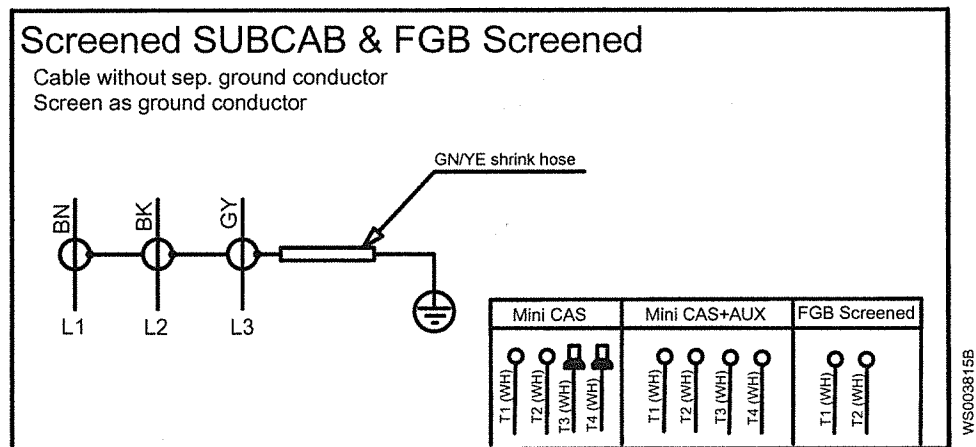


Figure 19: Screened SUBCAB and FGB Screened

4.6.3 MAS 711 connections

For the MAS 711 connection diagram, see *Connect the SUBCAB cables to the starter and MAS 711 monitoring equipment* (page 33).

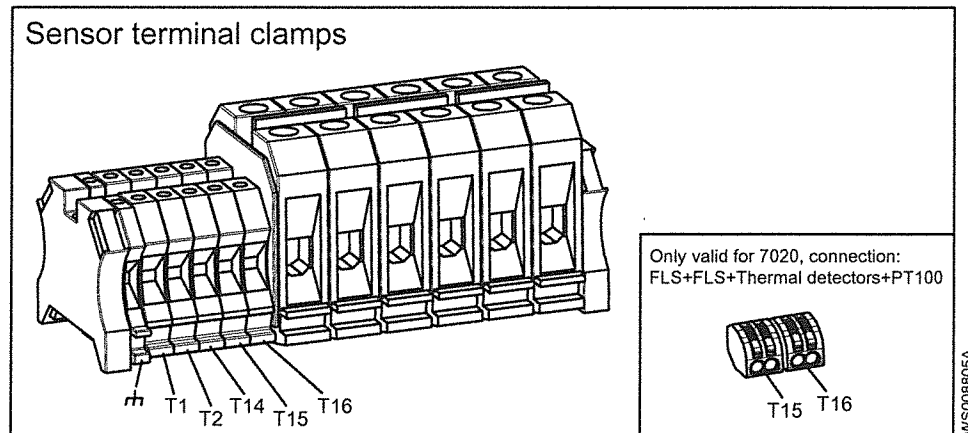
4.6.4 Sensor connection: MiniCAS

Color and marking of control leads			
Control	SUBCAB 4GX/7G and Screenflex	SUBCAB AWG	SUBCAB Screened
T1	WH T1	OG	WH T1
T2	WH T2	BU	WH T2
T3	-	-	WH T3
T4	-	-	WH T4

WS003843B

Figure 20: Color and marking of control leads

See *Color code standard* (page 37).



WS00805A

Figure 21: Sensor terminal clamps. Additional terminal clamps are shown at insert at lower right; only valid for P7020, connection: FLS + FLS + thermal detectors + Pt100.

4.6.5 MiniCAS connections

FLS and thermal detectors

Thermal detector, Ohms	Description
∞	Overtemperature
1200	OK
430	Leakage

The values have a 10 % tolerance.

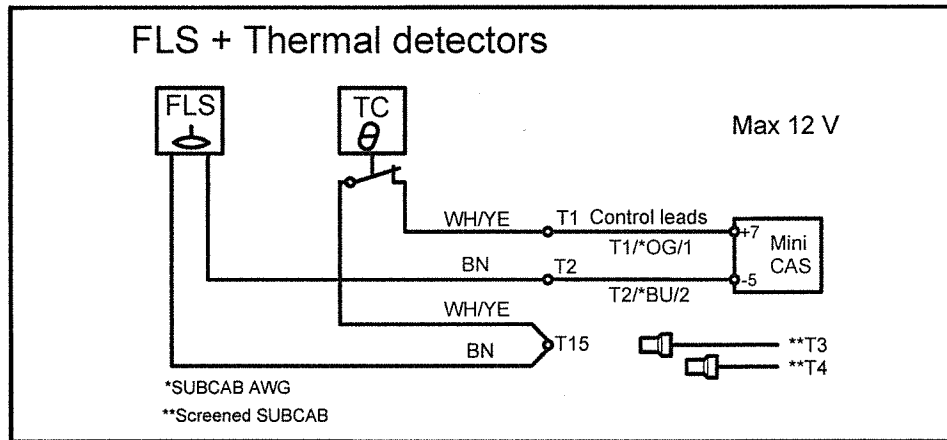


Figure 22: 1 FLS + thermal detectors

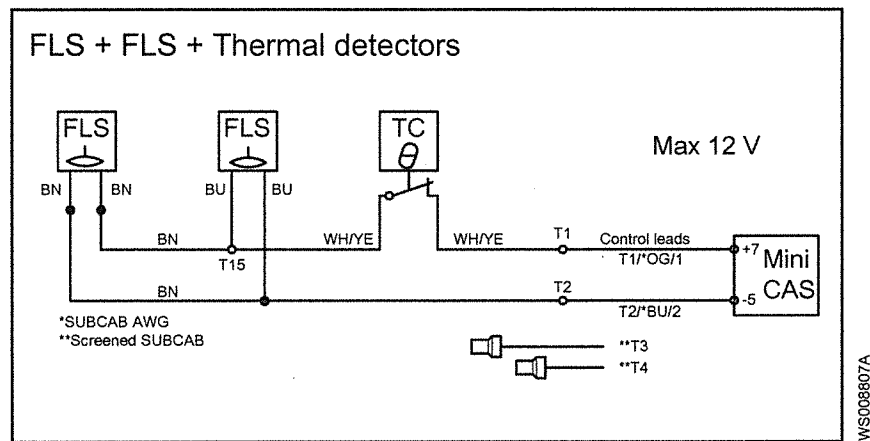


Figure 23: 2 FLS + thermal detectors

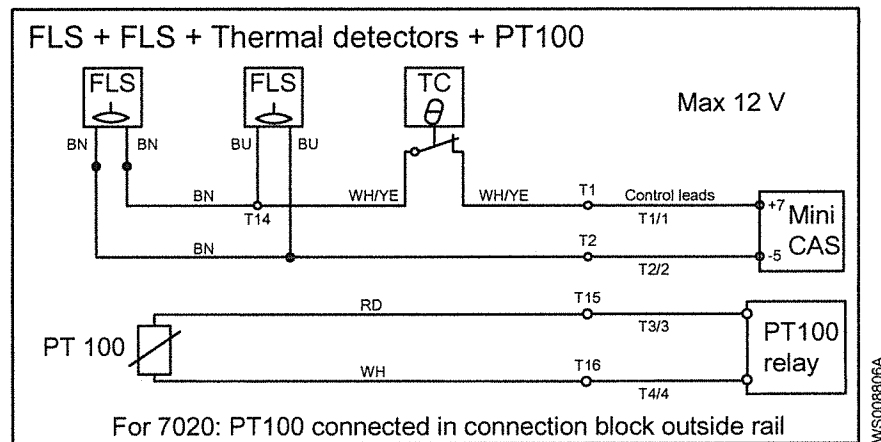


Figure 24: 2 FLS + thermal detectors + Pt100 (main bearing)

FLS and thermistor

T=25°C (77°F)	R ≤ 100 Ohm
T=135°C (275°F) (T _{REF} -5°C (23°F))	R ≤ 550 Ohm
T=145°C (293°F) (T _{REF} +5°C (41°F))	R ≤ 1330 Ohm

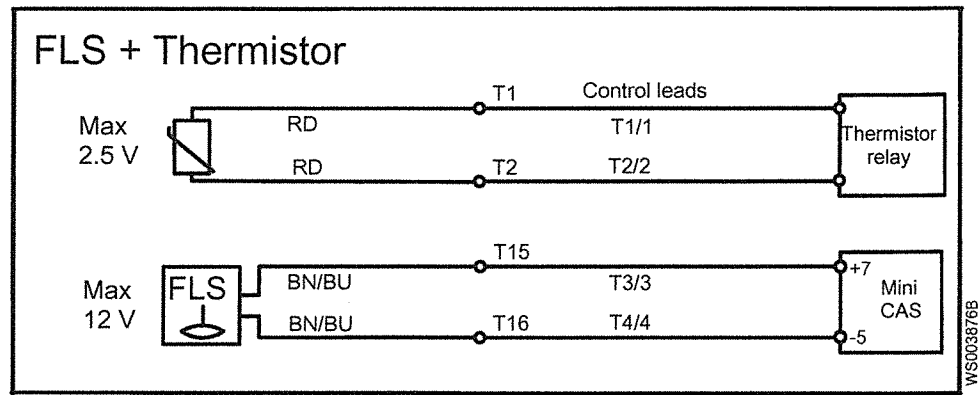


Figure 25: 1 FLS + thermistor

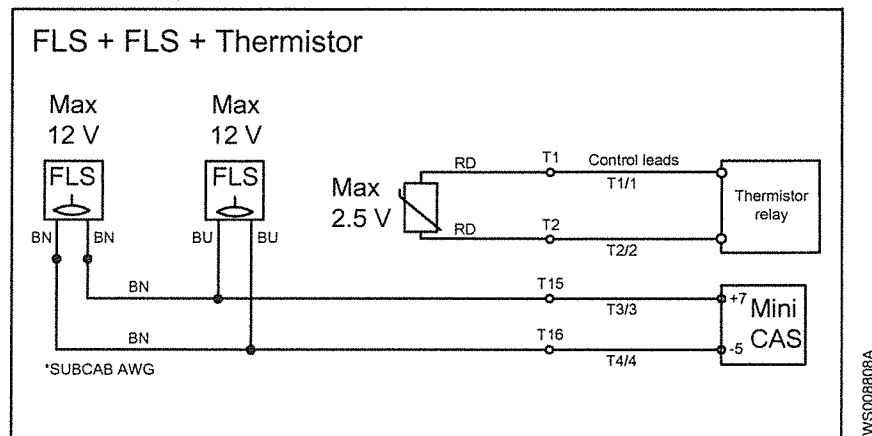


Figure 26: 2 FLS + thermistor

Thermal detectors; FLS disconnected

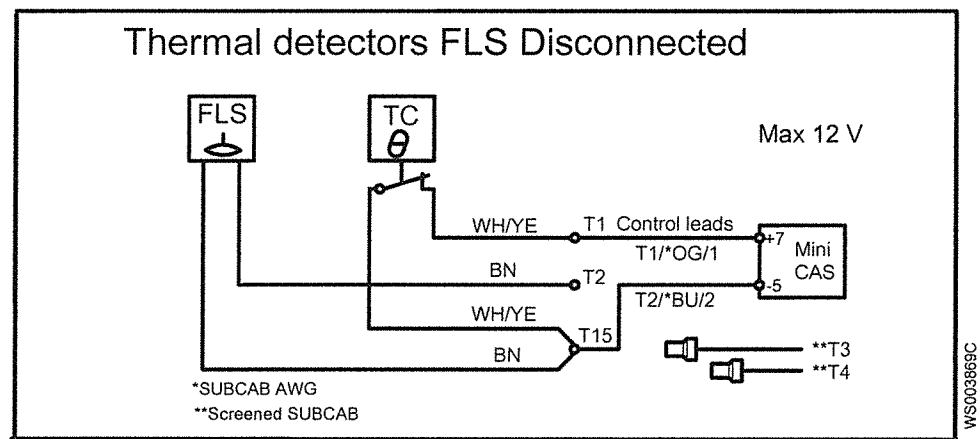


Figure 27: Thermal detectors connected, and FLS disconnected

Screened cables

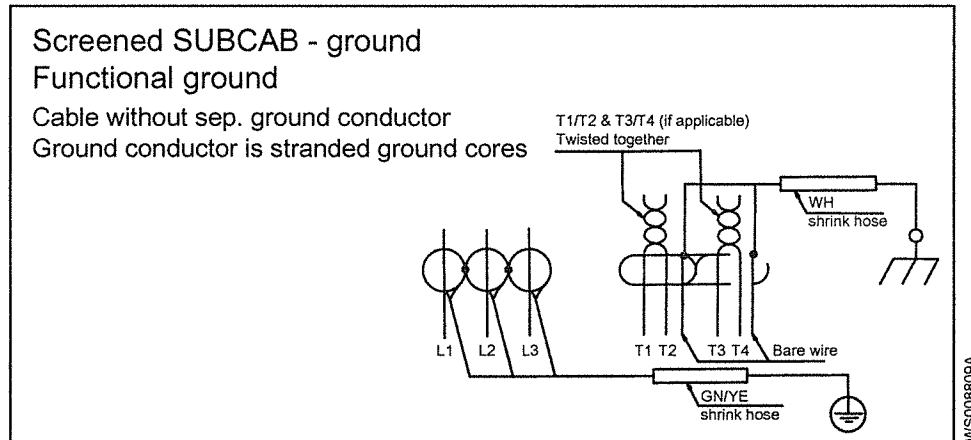
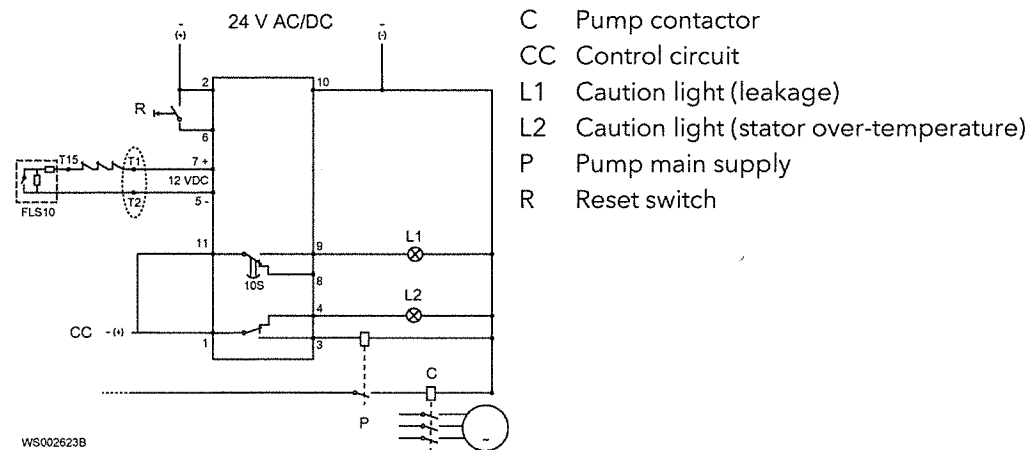


Figure 28: Cable without separate ground conductor. Ground conductor is stranded ground cores.

MiniCAS II



4.7 Check the impeller rotation

**CAUTION: Crush Hazard**

The starting jerk can be powerful. Make sure nobody is close to the unit when it is started.

If the propeller rotates in the wrong direction, then the pump lifts up and rotates, which can damage the cables.

1. Start the motor.
2. Stop the motor after a few seconds.
3. Check the propeller rotation.

The correct direction of propeller rotation is clockwise when you look at the pump from above.

Direction of propeller rotation. Generic pump shown.

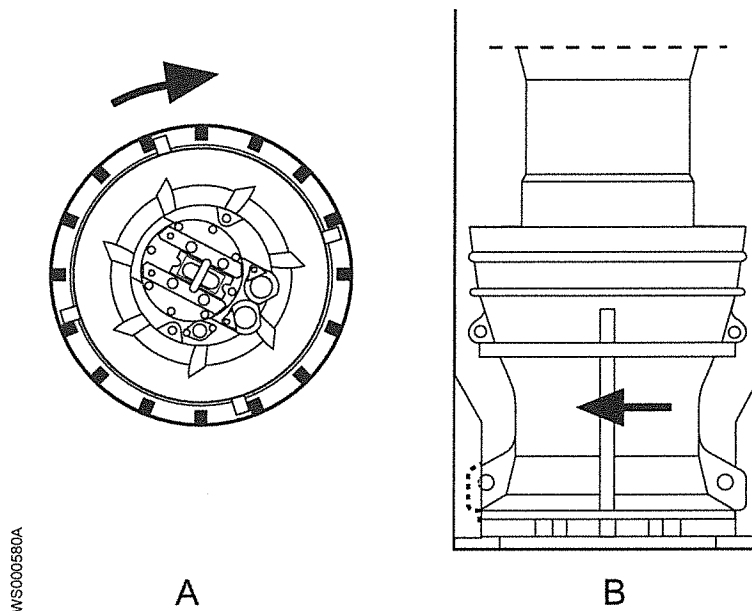


Figure 29: Top view (A) and side view (B)

4. If the impeller/propeller rotates in the wrong direction, then check that the phase leads are correctly connected. See *Power cable phase sequence* (page 34). After reconnecting phase leads, do this procedure again.

5 Operation

5.1 Precautions

Before taking the unit into operation, check the following:

- All recommended safety devices are installed.
- The cable and cable entry have not been damaged.
- All debris and waste material has been removed.

NOTICE:

Never operate the pump with the discharge line blocked, or the discharge valve closed.



WARNING: Crush Hazard

Risk of automatic restart.

Distance to wet areas



WARNING: Electrical Hazard

Risk of electrical shock or burn. You must connect an additional ground- (earth-) fault protection device to the grounded (earthed) connectors if persons are likely to come into contact with liquids that are also in contact with the pump or pumped liquid.



CAUTION: Electrical Hazard

Risk of electrical shock or burn. The equipment manufacturer has not evaluated this unit for use in swimming pools. If used in connection with swimming pools then special safety regulations apply.

Noise level

NOTICE:

The sound power level of the product is lower than 70 dB(A). However, in some installations the resulting sound pressure level may exceed 70 dB(A) at certain operating points on the performance curve. Make sure that you understand the noise level requirements in the environment where the product is installed. Failure to do so may result in hearing loss or violation of local laws.

5.2 Estimate zinc anode replacement intervals

The mass and surface area of the zinc anodes are designed to protect the pump surface for 1 year in sea water with an average temperature of 20°C (68°F). Shorter inspection intervals and anode replacement can be required, depending upon the water temperature and the chemical composition as well as the presence of other metals in the vicinity of the pump.

The rate of zinc consumption, and the appropriate inspection intervals, can be estimated by measuring how much zinc is consumed during the first two months following installation.

Anodes are replaced when the anode mass is reduced to a selected fraction of its initial mass. The recommended interval for the selection fraction is 0.25-0.50 (25-50%).

1. Remove, weigh, and reinstall one or more of the exterior zinc anodes before starting up the pump.
2. After two months, remove and weigh the same zinc anode or anodes again.

3. Divide the lapsed time in days (between steps 1 and 2) by the anode weight loss in grams to get the calculated anode consumption rate (days/gram).
If multiple anodes were weighed, then use the anode which has lost the most weight for this calculation.
4. Calculate future replacement intervals so that they occur when the selected fraction of zinc is remaining.

5.3 Start the pump



CAUTION: Crush Hazard

The starting jerk can be powerful. Make sure nobody is close to the unit when it is started.

NOTICE:

Make sure that the rotation of the impeller is correct. For more information, see Check the impeller rotation.

1. Remove the fuses or open the circuit breaker, and check that the impeller can rotate freely.



WARNING: Crush Hazard

Never put your hand into the pump housing.

2. Conduct insulation test phase to ground. To pass, the value must exceed 5 megaohms.
3. Check that the monitoring equipment works.
4. Start the pump.

6 Maintenance

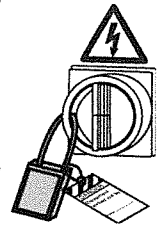
Precautions

Before starting work, make sure that the safety instructions in the chapter *Introduction and Safety* (page 3) have been read and understood.



DANGER: Crush Hazard

Moving parts can entangle or crush. Always disconnect and lock out power before servicing to prevent unexpected startup. Failure to do so could result in death or serious injury.



WARNING: Biological Hazard

Infection risk. Rinse the unit thoroughly with clean water before working on it.



CAUTION: Crush Hazard

Make sure that the unit cannot roll or fall over and injure people or damage property.

Make sure that you follow these requirements:

- Check the explosion risk before you weld or use electrical hand tools.
- Allow all system and pump components to cool before you handle them.
- Make sure that the product and its components have been thoroughly cleaned.
- Make sure that the work area is well-ventilated before you open any vent or drain valves, remove any plugs, or disassemble the unit.
- Do not open any vent or drain valves or remove any plugs while the system is pressurized. Make sure that the pump is isolated from the system and that pressure is relieved before you disassemble the pump, remove plugs, or disconnect piping.

Ground continuity verification

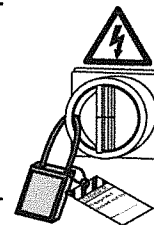
A ground (earth) continuity test must always be performed after service.

Rotating propeller



DANGER: Crush Hazard

Moving parts can entangle or crush. Always disconnect and lock out power before servicing to prevent unexpected startup. Failure to do so could result in death or serious injury.



Falling

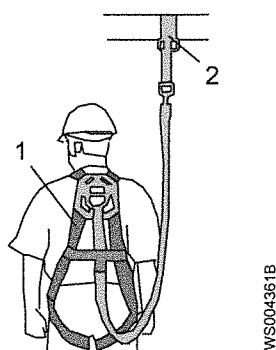


CAUTION: Fall Hazard

Slips and falls can cause severe injuries. Watch your step.

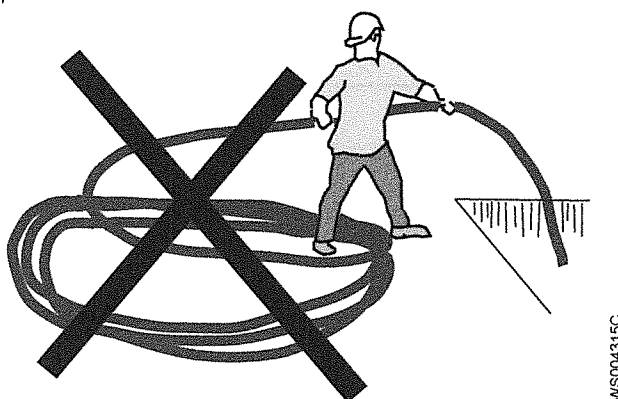
To minimize the risk of falling, observe the following:

- Use appropriate personal protection equipment when working in or near shafts, pits or trenches.



1. Fall protection harness
2. Anchoring point

- Make sure that all safety guards are in place and secure, and that there is a suitable barrier around the work area.
- Wear clean slip-resistant shoes.
- Make sure that any ladders or climbing equipment that is used is correctly sized and in good working condition.
- Never stand in coiled cables, ropes or wires, or between them and the open shaft or pit.



Diffuser adapter

When the pump is lifted for maintenance, then make sure that the diffuser adapter remains at the bottom of the column.

6.1 Torque values

All screws and nuts must be lubricated to achieve correct tightening torque. Screws that are screwed into stainless steel must have the threads coated with suitable lubricants to prevent seizing.

If there is a question regarding the tightening torques, please contact the local sales and service representative.

Screws and nuts

Table 11: Stainless steel, A2 and A4, torque Nm (ft-lbs)

Property class	M4	M5	M6	M8	M10	M12	M16	M20	M24	M30
50	1.0 (0.74)	2.0 (1.5)	3.0 (2.2)	8.0 (5.9)	15 (11)	27 (20)	65 (48)	127 (93.7)	220 (162)	434 (320)
70, 80	2.7 (2)	5.4 (4)	9.0 (6.6)	22 (16)	44 (32)	76 (56)	187 (138)	364 (268)	629 (464)	1240 (915)
100	4.1 (3)	8.1 (6)	14 (10)	34 (25)	66 (49)	115 (84.8)	248 (183)	481 (355)	–	–

Table 12: Steel, torque Nm (ft-lbs)

Property class	M4	M5	M6	M8	M10	M12	M16	M20	M24	M30
8.8	2.9 (2.1)	5.7 (4.2)	9.8 (7.2)	24 (18)	47 (35)	81 (60)	194 (143)	385 (285)	665 (490)	1310 (966.2)
10.9	4.0 (2.9)	8.1 (6)	14 (10)	33 (24)	65 (48)	114 (84)	277 (204)	541 (399)	935 (689)	1840 (1357)
12.9	4.9 (3.6)	9.7 (7.2)	17 (13)	40 (30)	79 (58)	136 (100)	333 (245)	649 (480)	1120 (825.1)	2210 (1630)

Hexagon screws with countersunk heads

For hexagon socket head screws with countersunk head, maximum torque for all property classes must be 80% of the values for property class 8.8 above.

6.2 Check the temperature sensors

If the pump is connected to the MAS monitoring system, then it is recommended that the sensors be checked in the MAS unit. Otherwise, use a multimeter.

The different types of temperature sensors are:

- Thermal switches
- PTC-thermistors
- Pt100

NOTICE:

Do not use a megger or other device applying a higher voltage than 2.5 V.

1. Disconnect the sensor wires.
2. Measure the resistance to check the status of the sensor and wiring according to the values in *Sensors* (page 12).
3. Measure between each sensor lead to ground (earth) to establish that the resistance is infinite (or at least several Megaohm).

6.3 Check the leakage sensors

If the pump is connected to the MAS monitoring system, then it is recommended that the sensors be checked in the MAS unit. Otherwise, use a multimeter.

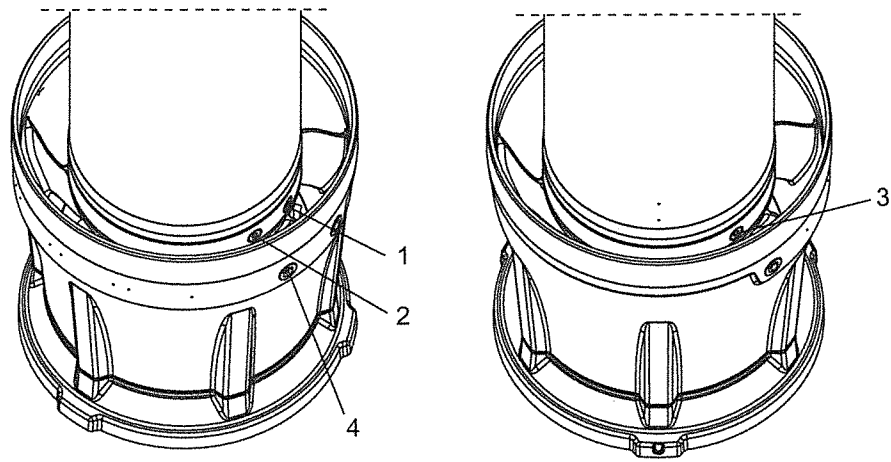
1. Check the float switch (FLS) in the inspection chamber, according to the values in *Sensors* (page 12).

Measure ohms by using a multimeter to establish either of the conditions below (or both if the sensor is accessible).

2. Check the float switch (FLS) in the junction box (connection housing).

6.4 Changing the oil

This figure shows where the plugs for change of oil are placed on the unit.



1. Oil plug
2. Inspection plug
3. Oil plug
4. Outer screw

Figure 30: With a cooling jacket

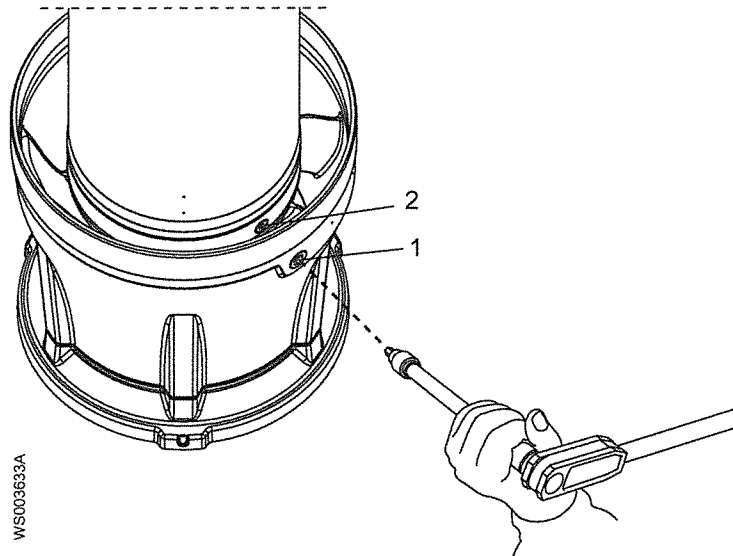
6.4.1 Empty the oil



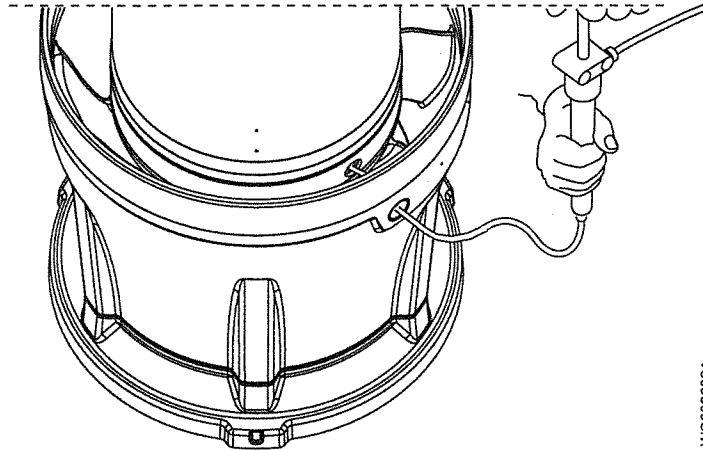
CAUTION: Compressed Gas Hazard

Air inside the chamber may cause parts or liquid to be propelled with force. Be careful when opening. Hold a rag over the plug to prevent liquid from spraying out.

1. Remove the outer screw and the inner screw of both oil plugs, and the inspection plug, on the hydraulic part.



1. Outer screw
 2. Inner screw
2. Thread the hose of the hand-pump through the inner and outer holes into the seal chamber.



WS003632A

3. Pump out any liquid from the seal chamber.
4. Remove the inspection plug.
5. Pump out any liquid from the inspection chamber.
6. Reassemble the inspection plug with a new O-ring. Remount the plug and tighten.
Tightening torque: 44 Nm (33 ft-lb)
7. Remount the outer screw for the inspection plug.
Tightening torque: 76 Nm (57 ft-lb)

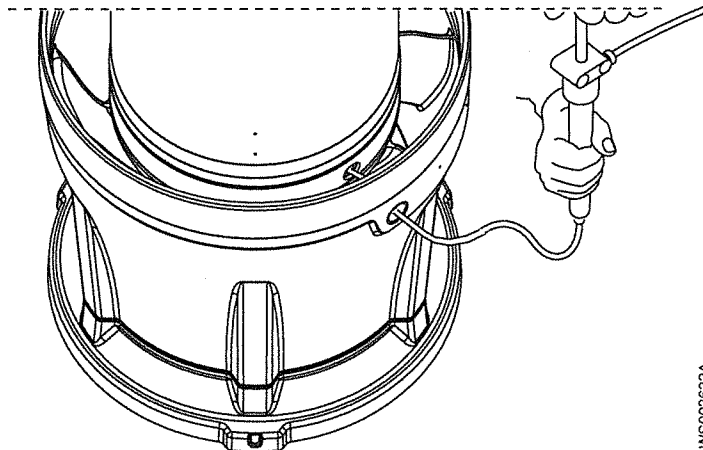
6.4.2 Fill with oil

The pump is delivered with a tasteless, odorless, medical white oil of paraffin type that fulfills FDA 172.878.

Examples of suitable oil types are the following:

- Statoil MedicWay 32™
- BP Enerpar M 004™
- Shell Ondina 927™
- Shell Ondina X430™

1. Thread the hose of the hand-pump through both of the holes into the seal chamber.



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2. Pump oil into the seal chamber until it overflows through the opposite hole.

Table 13: Approximate oil quantities

Pump	Quantity, L (qt)
7030	2.4 (2.5)

Pump	Quantity, L (qt)
7035	3.6 (3.8)
7040	3.8 (4.0)

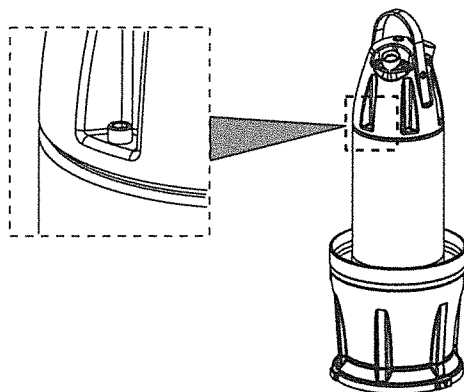
3. Replace the O-rings with new ones.
4. Remount the oil plugs and tighten.
Tightening torque: 44 Nm (33 ft-lb)
5. Remount the outer screws for the oil plug.
Tightening torque: 76 Nm (57 ft-lb)

6.5 Preparing for work on the hydraulic end

Some maintenance work on the hydraulic end of the pump, such as changing the impeller or replacing zinc anodes, requires that the pump be turned upside-down.

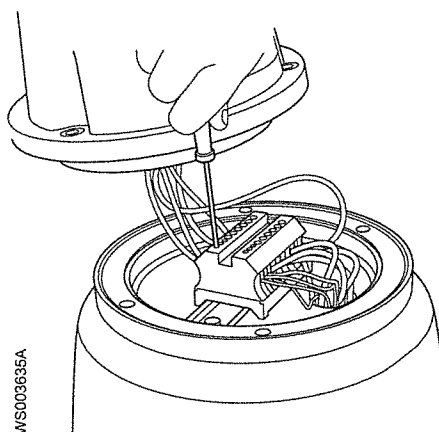
6.5.1 Remove the entrance cover

1. Remove the entrance cover screws.



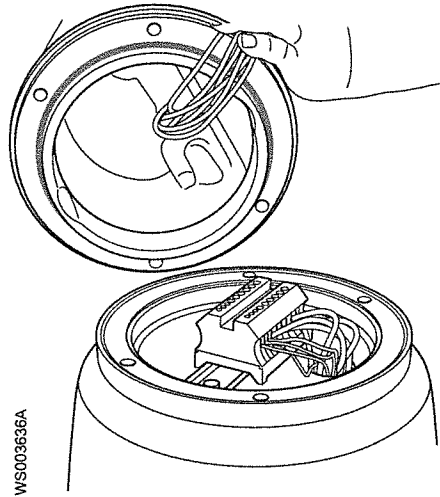
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2. Disconnect the cable leads.



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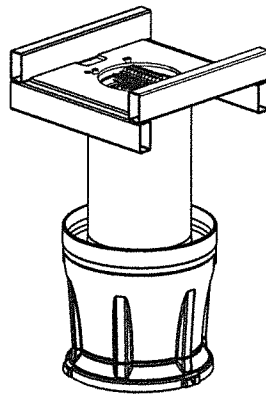
3. Lift off the entrance cover.



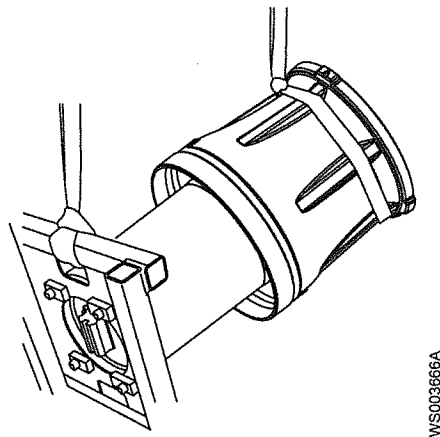
6.5.2 Attach the assembly and dismantling stand

Two lifting devices are required for this task.

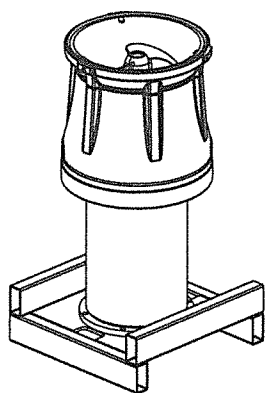
1. Bolt the assembly/dismantling stand (605 70 00) in position. Secure it using the screws for the entrance cover.



2. Attach lifting straps as shown in the following figure, and lift the pump.



3. Place the drive unit upside down on the stand.



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6.6 Replacing the propeller

Required tools:

- Stand 605 70 00
- 14 mm hexagon bit adapter with an extension bar
- Trim tool (17 mm hexagon bit adapter with an extension bar)
- Rod (wood or plastic) for locking the impeller in place.

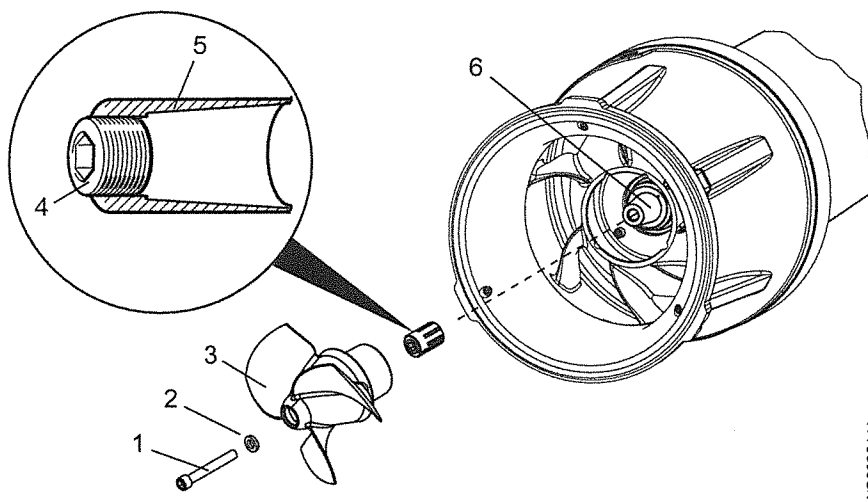


CAUTION: Cutting Hazard

Worn parts can have sharp edges. Wear protective clothing.

During this procedure the pump is upside down. The stand 605 70 00 is used to support the pump in the upside down position. For instructions for attaching the stand, see *Preparing for work on the hydraulic end* (page 53).

The propeller parts are shown in the following figure.



WS003614A

1. Propeller screw
2. Washer
3. Propeller
4. Adjustment screw
5. Conical sleeve
6. Conical shaft end

6.6.1 Measure the clearance

Depending on the type of media that is being pumped the pump will be more or less exposed to wear, mainly in the gap between the propeller blades and the pump housing.

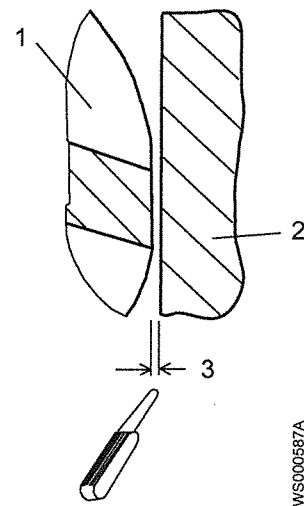
The clearance between the propeller blades and the pump housing will increase. The effect of this is that the capacity as well as the efficiency will drop. It should be noted that these effects are not linearly proportional to the size of the clearance, but progressive.

Operating the pump when the blade-housing clearance has reached or exceeded the clearance threshold will result in a loss of capacity (flow) and pump efficiency.

It is therefore recommended that the blade-housing clearance be checked at routine inspections and worn parts be replaced as necessary. If the measured blade-housing clearance exceeds the critical limit, then we recommend that the efficiency drop be evaluated and replacement of worn parts be considered.

1. Measure the clearance between the propeller blades and the pump housing in a few places to get an average value.

The blade-housing clearance can vary slightly as the propeller might not be perfectly centered due to manufacturing tolerances.



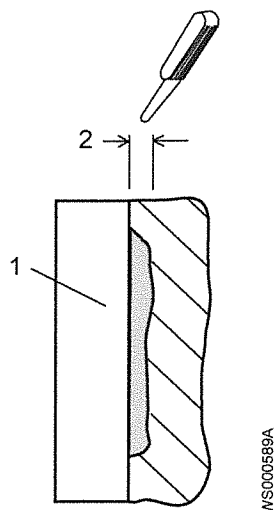
1. Propeller
2. Pump housing
3. Critical clearance

Figure 31: Critical clearance

Pump	Clearance threshold for efficiency drop, mm (in)
7030	1.3 (0.051)
7035	1.2 (0.047)
7040	1.6 (0.063)

If the measured clearance is less than the threshold value given in the table above, then the rest of the steps in this section can be omitted. If the measured clearance is greater than the threshold value in the table above, then proceed as follows:

2. Measure the wear in the pump housing with a thickness gauge by placing the edge of a ruler across the surface of the housing.



1. Ruler
2. Wear

3. Replace parts according to the table.

Pump	Wear measured, mm (in)	Action
7030	0.3 (0.012)	Replace the propeller
	1.0 (0.039)	Replace the bellmouth
7035	0.3 (0.012)	Replace the propeller
	0.9 (0.035)	Replace the bellmouth
7040	0.4 (0.016)	Replace the propeller
	1.2 (0.047)	Replace the bellmouth

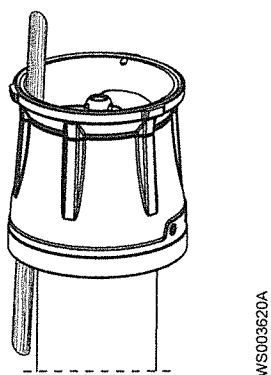
6.6.2 Remove the propeller



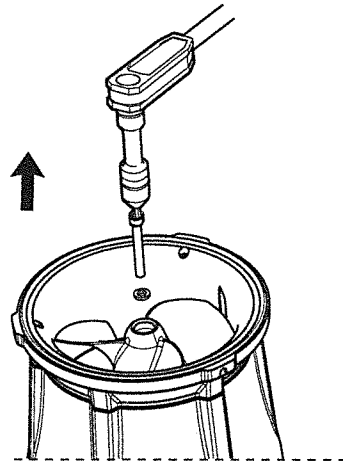
CAUTION: Cutting Hazard

Sharp edges. Wear protective clothing.

1. Lock the propeller in place by inserting a rod or piece of wood through the pump housing outlet.

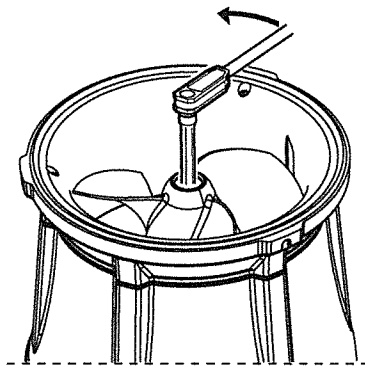


2. Loosen the propeller:
 - a) Remove the propeller screw and washer.



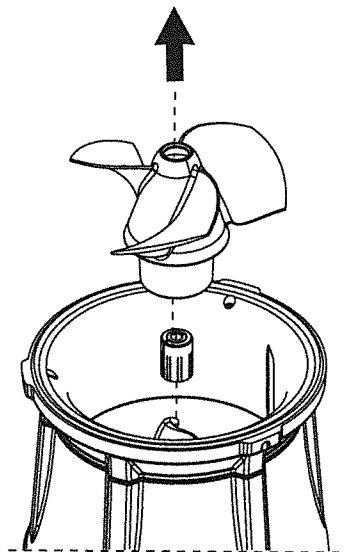
WS003615A

- b) Turn the adjustment screw counterclockwise until the propeller breaks free from the shaft.
Use the trim tool.



WS003619A

3. Remove the propeller and the propeller sleeve.



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6.6.3 Install the propeller

1. Prepare the shaft:
 - a) Polish off any flaws with a fine emery cloth.

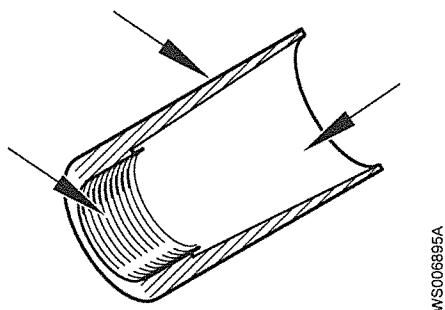
The end of the shaft must be clean and free from burrs.

- b) Coat the inner conic, the outer cylindrical surfaces, and the thread of the conical sleeve with a thin layer of grease.

The proper lubrication is grease for bearings, for example Exxon Mobil Unirex N3, Mobil Mobilith SHC 220 or equivalent.

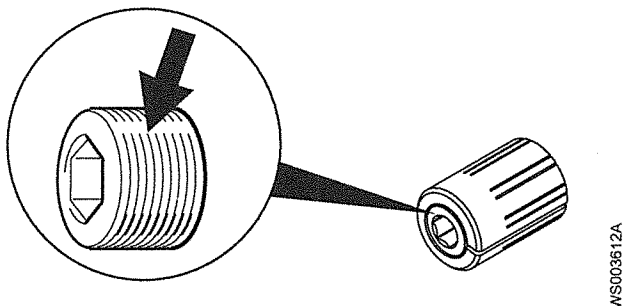
NOTICE:

Surplus grease can cause the impeller to become loose. Remove surplus grease from conical and/or cylindrical surfaces of shafts and/or sleeves.



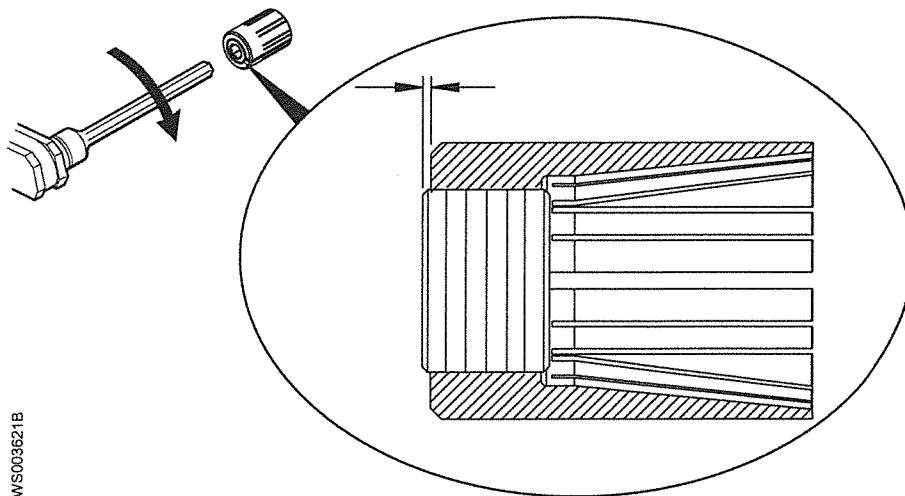
2. Mount the propeller:

- a) Adjust the trim screw so that it aligns with the bottom surface of the sleeve.



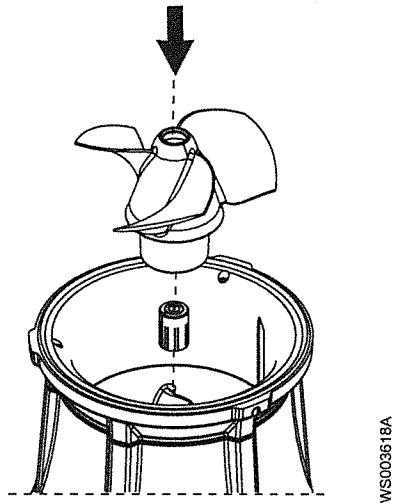
- b) Turn the adjustment screw 3/4 of a turn, so that it juts out from the sleeve approximately 1.5 mm (0.06 in).

Use the trim tool.

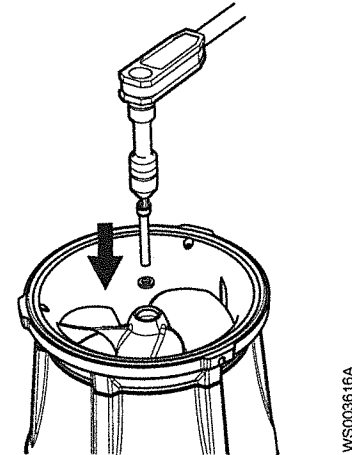


- c) Fit the sleeve onto the shaft.
- d) Carefully fit the propeller to the shaft.

Make sure that the sleeve and propeller are pushed on straight onto the shaft. If not they might get stuck part way on.



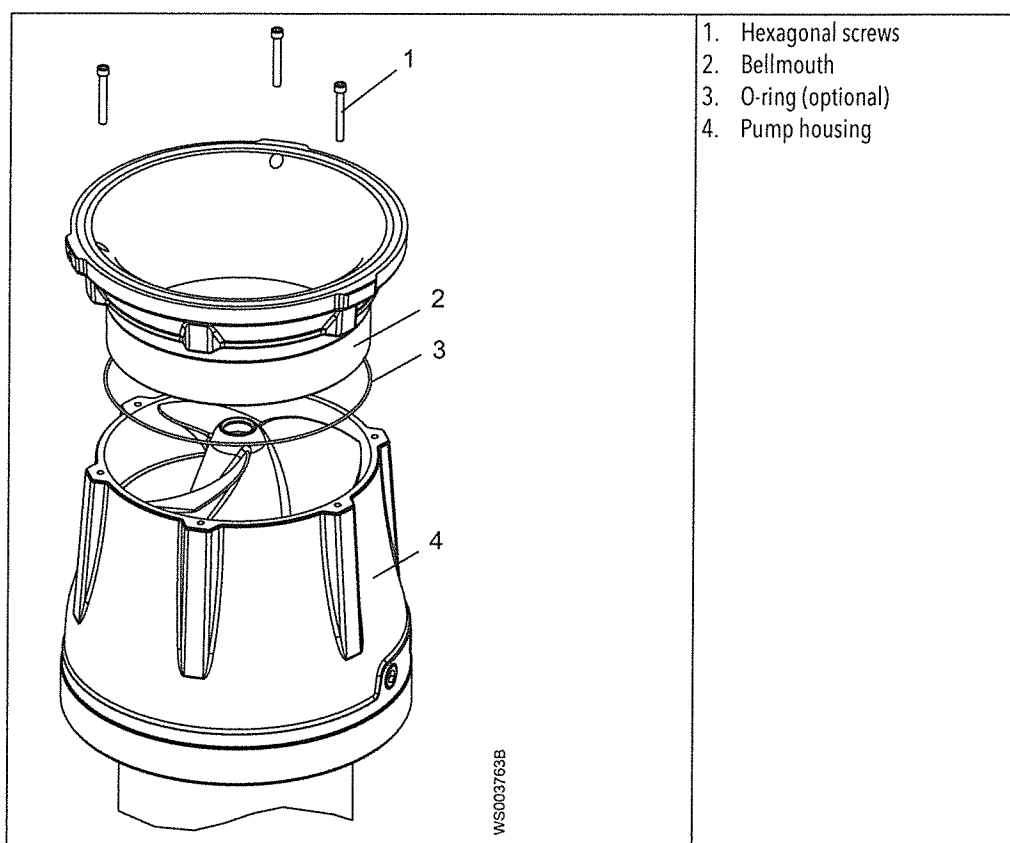
3. Fit the propeller screw and washer.



4. Tighten the propeller screw.
5. Tighten the propeller screw a further 1/8 turn (45°).
6. Check that the propeller can rotate freely.

6.7 Replace the bellmouth

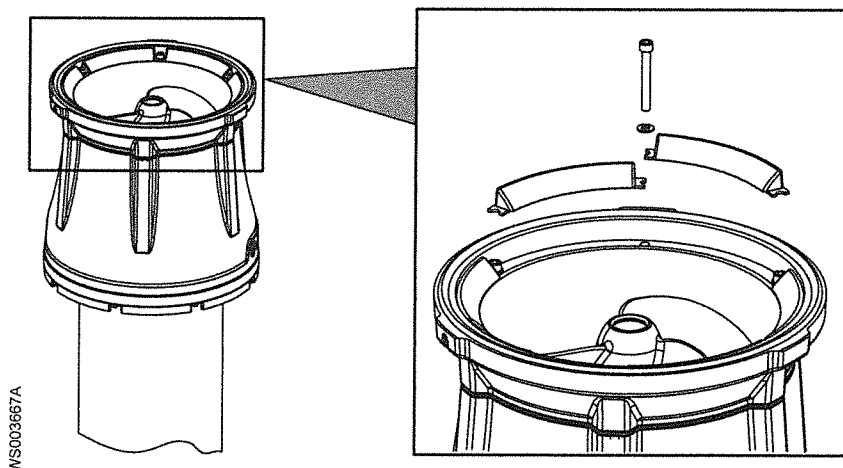
1. Remove the three hexagonal screws securing the bellmouth.
If there are zinc anodes, then six hexagonal screws must be removed.



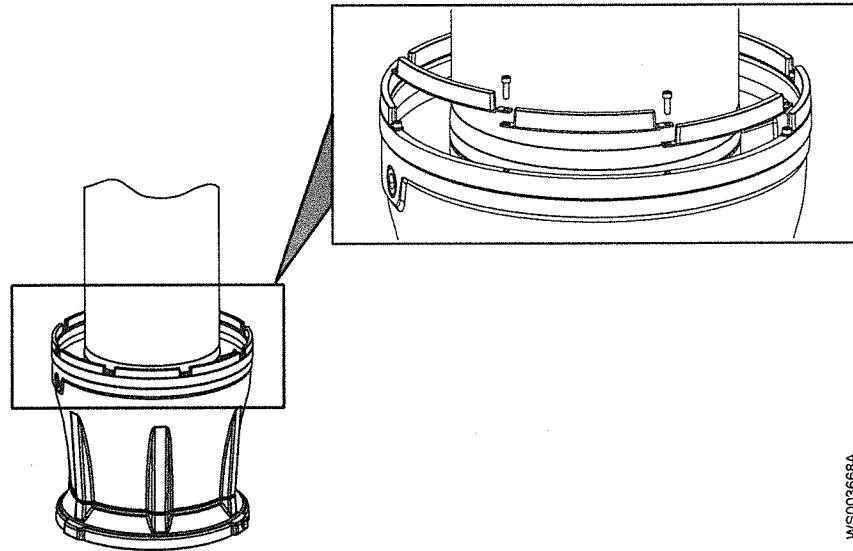
2. Lift off the bellmouth.
3. Put the new bellmouth in place.
The O-ring is delivered from the factory but does not need to be replaced after initial use.
4. If zinc anodes are used, then remount them.
5. Fasten the screws.

6.8 Replace the zinc anodes

1. Loosen the hexagonal screws securing the zinc anodes at the inlet.



2. Replace the zinc anodes and fasten the screws.
3. Loosen the hexagonal screws securing the anodes at the outlet.



WS003668A

4. Replace the zinc anodes and fasten the screws.

6.9 Service the pump

Type of service	Purpose	Inspection interval
Initial inspection	A Xylem-authorized personnel checks the pump condition. From the results, the personnel recommends the intervals for the periodical inspection and major overhaul for the installation.	Within the first year of operation.
Periodical inspection	The inspection prevents operational interruptions and machine breakdowns. The measures to increase performance and pump efficiency are decided for each application. They can include such things as impeller trimming, wear part control and replacement, control of zinc-anodes and control of the stator.	Up to 12,000 hours or three years, whichever comes first. Applies to normal applications and operating conditions at media (liquid) temperatures <40°C (104°F).
Major overhaul	The overhaul lengthens the operating lifetime of the product. It includes the replacement of key components and the measures that are taken during an inspection.	Up to 24,000 hours or six years, whichever comes first. Applies to normal applications and operating conditions at media (liquid) temperatures <40°C (104°F).

NOTICE:

Shorter intervals may be required when the operating conditions are extreme, for example with very abrasive or corrosive applications or when the liquid temperatures exceed 40°C (104°F).

6.9.1 Inspection

Service item	Action
Cable	<ol style="list-style-type: none"> 1. If the outer jacket is damaged, replace the cable. 2. Check that the cables do not have any sharp bends and are not pinched.
Connection to power	Check that the connections are properly secured.
Electrical cabinets	Check that they are clean and dry.
Propeller	<ol style="list-style-type: none"> 1. Check the propeller clearance. 2. Replace the propeller, if necessary.

Service item	Action
Inspection chamber	<ol style="list-style-type: none"> 1. Drain all liquid, if any. 2. Check the resistance of the leakage sensor. Normal value approximately 1200 ohms, alarm approximately 430 ohms <p>If the pump is connected to the MAS 711 then it is recommended that the sensors be checked in the MAS 711 unit. Otherwise, use a multimeter. For values, see <i>Sensors</i> (page 12).</p>
Insulation	<p>Use a megger maximum 1000 V.</p> <ol style="list-style-type: none"> 1. Check that the resistance between the ground (earth) and phase lead is more than 5 megohms. 2. Conduct a phase-to-phase resistance check.
Junction box	<ol style="list-style-type: none"> 1. General: Check that it is clean and dry. If it is wet, then do the following: <ol style="list-style-type: none"> a. Check the cable entry. b. Replace the O-rings. New O-rings should be fitted to all O-ring seal joints opened during inspection. 2. Check the resistance of the leakage sensor. If the pump is connected to the MAS 711, then it is recommended that the sensors be checked in the MAS 711 unit. Otherwise, use a multimeter. Normal value approximately 1530 ohms, alarm approximately 330 ohms. For values, see <i>Sensors</i> (page 12). 3. Terminal board: Check that the connections are properly tightened.
Level regulators	Check the condition and functionality.
Lifting device	Check that the local safety regulations are followed.
O-rings	<ol style="list-style-type: none"> 1. Replace the oil plug O-rings. 2. Replace the O-rings at the entrance or junction cover. 3. Grease the new O-rings.
Overload protection and other protections	Check the correct settings.
Personnel safety devices	Check the guard rails, covers, and other protections.
Rotation direction	Check the propeller rotation.
Seal housing	Fill with new oil, if necessary.
Terminal board	Check that the connections are properly secured.
Temperature sensors, MAS 711: <ul style="list-style-type: none"> - Thermal contact - Thermistor - Pt100 	<p>If the pump is connected to the MAS 711, then it is recommended that the sensors be checked in the MAS 711 unit. Otherwise, use a multimeter. Do not use a device applying a higher voltage than 2.5 V.</p> <ol style="list-style-type: none"> 1. Disconnect the sensor leads. 2. Measure the resistance to check the status of the sensor and leads according to values in <i>Sensors</i> (page 12). Make sure to select values for the appropriate sensor, monitoring equipment, and sensor combination. 3. Measure between each sensor lead to ground (earth) to establish that the resistance is infinite (or at least several Megaohms).
Thermal contacts, MiniCAS	Normally closed circuit, interval 0–1 ohm.
Thermistor, MiniCAS	Check the resistance is between 20–250 ohms and the measured voltage is maximum 2 V DC.
Voltage and amperage	Check the running values.

6.9.2 Major overhaul

For a major overhaul, take this action in addition to the tasks listed under Inspection.

Service item	Action
Support and main bearing	Replace the bearings with new bearings.
Mechanical seal	Replace with new seal unit.

6.9.3 Service in case of alarm

Alarm source	Action
FLS10	<ol style="list-style-type: none"> 1. Drain the fluid in the inspection chamber. 2. Check the oil level. Fill with new oil if necessary. <p>Check the inspection chamber again after one week of operation. If leakage has occurred, then do the following:</p> <ol style="list-style-type: none"> 1. Drain the fluid. 2. Change the mechanical seal unit. 3. Replace the oil with new oil.
The thermistor/thermal contact	Check the start and stop levels.
The overload protection	Check that the propeller can rotate freely.

7 Troubleshooting

Introduction



DANGER: Electrical Hazard

Troubleshooting a live control panel exposes personnel to hazardous voltages. Electrical troubleshooting must be done by a qualified electrician.

Follow these guidelines when troubleshooting:

- Disconnect and lock out the power supply except when conducting checks that require voltage.
- Make sure that no one is near the unit when the power supply is reconnected.
- When troubleshooting electrical equipment, use the following:
 - Universal instrument multimeter
 - Test lamp (continuity tester)
 - Wiring diagram

7.1 The pump does not start



DANGER: Crush Hazard

Moving parts can entangle or crush. Always disconnect and lock out power before servicing to prevent unexpected startup. Failure to do so could result in death or serious injury.

NOTICE:

Do NOT override the motor protection repeatedly if it has tripped. Doing so may result in equipment damage.

Cause	Remedy
An alarm signal has been triggered on the control panel.	Check that: <ul style="list-style-type: none"> • The impeller rotates freely. • The sensor indicators do not indicate an alarm. • The overload protection is not tripped. If the problem still persists: Contact the local sales and service representative.
The pump does not start automatically, but can be started manually.	Check that: <ul style="list-style-type: none"> • The start level regulator is functioning. Clean or replace if necessary. • All connections are intact. • The relay and contactor coils are intact. • The control switch (Man/Auto) makes contact in both positions. Check the control circuit and functions.
The installation is not receiving voltage.	Check that: <ul style="list-style-type: none"> • The main power switch is on. • There is control voltage to the start equipment. • The fuses are intact. • There is voltage in all phases of the supply line. • All fuses have power and that they are securely fastened to the fuse holders. • The overload protection is not tripped. • The motor cable is not damaged.

Cause	Remedy
The impeller is stuck.	Clean: <ul style="list-style-type: none"> • The impeller • The sump in order to prevent the impeller from clogging again.

Always state the serial number of your product, see *Product Description* (page 10).

7.2 The pump does not stop when a level sensor is used



DANGER: Crush Hazard

Moving parts can entangle or crush. Always disconnect and lock out power before servicing to prevent unexpected startup. Failure to do so could result in death or serious injury.

Cause	Remedy
The pump is unable to empty the sump to the stop level.	Check that: <ul style="list-style-type: none"> • There are no leaks from the piping and/or discharge connection. • The impeller is not clogged. • The non-return valve(s) are functioning properly. • The pump has adequate capacity. For information: Contact the local sales and service representative.
There is a malfunction in the level-sensing equipment.	<ul style="list-style-type: none"> • Clean the level regulators. • Check the functioning of the level regulators. • Check the contactor and the control circuit. • Replace all defective items.
The stop level is set too low.	Raise the stop level.

Always state the serial number of your product, see *Product Description* (page 10).

7.3 The pump starts-stops-starts in rapid sequence

Cause	Remedy
The pump starts due to back-flow which fills the sump to the start level again.	Check that: <ul style="list-style-type: none"> • The distance between the start and stop levels is sufficient. • The non-return valve(s) work(s) properly. • The length of the discharge pipe between the pump and the first non-return valve is sufficiently short.
The self-holding function of the contactor malfunctions.	Check: <ul style="list-style-type: none"> • The contactor connections. • The voltage in the control circuit in relation to the rated voltages on the coil. • The functioning of the stop-level regulator. • Whether the voltage drop in the line at the starting surge causes the contactor's self-holding malfunction.

Always state the serial number of your product, see *Product Description* (page 10).

7.4 The pump runs but the motor protection trips



DANGER: Crush Hazard

Moving parts can entangle or crush. Always disconnect and lock out power before servicing to prevent unexpected startup. Failure to do so could result in death or serious injury.

NOTICE:

Do NOT override the motor protection repeatedly if it has tripped. Doing so may result in equipment damage.

Cause	Remedy
The motor protection is set too low.	Set the motor protection according to the data plate and if applicable the cable chart.
The impeller is difficult to rotate by hand.	<ul style="list-style-type: none"> • Clean the impeller. • Clean out the sump. • Check the clearance between the propeller and the pump housing.
The drive unit is not receiving full voltage on all three phases.	<ul style="list-style-type: none"> • Check the fuses. Replace fuses that have tripped. • If the fuses are intact, notify a certified electrician.
The phase currents vary, or they are too high.	Contact the local sales and service representative.
The insulation between the phases and ground in the stator is defective.	<ol style="list-style-type: none"> 1. Use an insulation tester. With a 1000 V DC megger, check that the insulation between the phases and between any phase and ground is > 5 megaohms. 2. If the insulation is less: Contact the local sales and service representative.
The density of the pumped fluid is too high.	<p>Make sure that the maximum density is 1100 kg/m³ (9.2 lb/US gal)</p> <ul style="list-style-type: none"> • Change the impeller, or • Change to a more suitable pump. • Contact the local sales and service representative.
There is a malfunction in the overload protection.	Replace the overload protection.

Always state the serial number of your product, see *Product Description* (page 10).

7.5 The pump delivers too little or no water

**DANGER: Crush Hazard**

Moving parts can entangle or crush. Always disconnect and lock out power before servicing to prevent unexpected startup. Failure to do so could result in death or serious injury.

NOTICE:

Do NOT override the motor protection repeatedly if it has tripped. Doing so may result in equipment damage.

Cause	Remedy
The impeller rotates in the wrong direction.	See <i>Check the impeller rotation</i> (page 44).
One or more of the valves are set in the wrong positions.	<ul style="list-style-type: none"> • Reset the valves that are set in the wrong position. • Replace the valves, if necessary. • Check that all valves are correctly installed according to media flow. • Check that all valves open correctly.
The impeller is difficult to rotate by hand.	<ul style="list-style-type: none"> • Clean the impeller. • Clean out the sump. • Check the clearance between the propeller and the pump housing.
The pipes are obstructed.	Clean out the pipes to ensure a free flow.
The pipes and joints leak.	Find the leaks and seal them.

Cause	Remedy
There are signs of wear on the impeller, pump, and casing.	Replace the worn parts.
The liquid level is too low.	<ul style="list-style-type: none">• Check that the level sensor is set correctly.• Depending on the installation type, add a means for priming the pump, such as a foot valve.

Always state the serial number of your product, see *Product Description* (page 10).

8 Technical Reference

8.1 Application limits

Table 14: Process data

Parameter	Value
Liquid temperature	Max. +40°C (+105°F)
Depth of immersion	Max. 20 m (65 ft.)
pH of pumped liquid	pH 5.5-14
Liquid density	Max. 1100 kg/m ³ (9.17 lb per gal.)

8.2 Pt100 resistance

This table shows the relationship between temperature (°C) and resistance (ohms).

T, °C	R, ohms	T, °C	R, ohms	T, °C	R, ohms	T, °C	R, ohms	T, °C	R, ohms
0	100.00	33	112.83	66	125.54	99	138.12	132	150.57
1	100.39	34	113.22	67	125.92	100	138.50	133	150.95
2	100.78	35	113.61	68	126.31	101	138.88	134	151.33
3	101.17	36	113.99	69	126.69	102	139.26	135	151.70
4	101.56	37	114.38	70	127.07	103	139.64	136	152.08
5	101.95	38	114.77	71	127.45	104	140.02	137	152.45
6	102.34	39	115.15	72	127.84	105	140.39	138	152.83
7	102.73	40	115.54	73	128.22	106	140.77	139	153.20
8	103.12	41	115.93	74	128.60	107	141.15	140	153.58
9	103.51	42	116.31	75	128.98	108	141.53	141	153.95
10	103.90	43	116.70	76	129.37	109	141.91	142	154.32
11	104.29	44	117.08	77	129.75	110	142.29	143	154.70
12	104.68	45	117.47	78	130.13	111	142.66	144	155.07
13	105.07	46	117.85	79	130.51	112	143.04	145	155.45
14	105.46	47	118.24	80	130.89	113	143.42	146	155.82
15	105.85	48	118.62	81	131.27	114	143.80	147	156.19
16	106.24	49	119.01	82	131.66	115	144.17	148	156.57
17	106.63	50	119.40	83	132.04	116	144.55	149	156.94
18	107.02	51	119.78	84	132.42	117	144.93	150	157.31
19	107.40	52	120.16	85	132.80	118	145.31	151	157.69
20	107.79	53	120.55	86	133.18	119	145.68	152	158.06
21	108.18	54	120.93	87	133.56	120	146.06	153	158.43
22	108.57	55	121.32	88	133.94	121	146.44	154	158.81
23	108.96	56	121.70	89	134.32	122	146.81	155	159.18
24	109.35	57	122.09	90	134.70	123	147.19	156	159.55
25	109.73	58	122.47	91	135.08	124	147.57	157	159.93
26	110.12	59	122.86	92	135.46	125	147.94	158	160.30
27	110.51	60	123.24	93	135.84	126	148.32	159	160.67
28	110.90	61	123.62	94	136.22	127	148.70	160	161.04

T, °C	R, ohms		T, °C	R, ohms		T, °C	R, ohms		T, °C	R, ohms		T, °C	R, ohms
29	111.28		62	124.01		95	136.60		128	149.07			
30	111.67		63	124.39		96	136.98		129	149.45			
31	111.94		64	124.77		97	137.36		130	149.82			
32	112.45		65	125.16		98	137.74		131	150.20			

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